AMENDMENT TO

the

ENVIRONMENTAL ASSESSMENT

BIRD DAMAGE MANAGEMENT

IN THE

TENNESSEE WILDLIFE SERVICES

PROGRAM

United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services

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1.0 Introduction

An environmental assessment (EA) was prepared by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services' (WS) program to evaluate potential impacts to the human environment from the implementation of a bird damage management (BDM) program to address bird damage to property, agricultural resources, natural resources, and threats to public health and safety pursuant to requests for such service on public and private lands throughout Tennessee. The EA evaluated the need for BDM activities and the relative effectiveness of four alternatives to meet that need, while accounting for the potential environmental effects of those activities.

The EA analyzes the effects of WS' activities in Tennessee to manage damage and conflicts caused by bird species or family groups that include, but not limited to, the following: European Starlings (*Sturnus vulgaris*), blackbirds (family Emberizidae, subfamily Icterinae), Rock Pigeons (feral pigeons) (*Columba livia*), American Crows (*Corvus brachyrhynchos*), woodpeckers (family Picidae), Canada geese (Branta *canadensis)*, ducks (family Anatidae, subfamily Anatinae), American Coot (*Fulica americana*), swallows (family Hirundinidae), House Sparrow (*Passer domesticus*), House Finch (*Carpodacus mexicanus*), raptors (hawks, owls, and vultures; families Falconidae, Accipitridae, Tytonidae, Strigidae, and Cathartidae), Mourning Doves (*Zenaida macroura*), gulls (family Laridae), herons and egrets (family Ardeidae), and Double-Crested Cormorants (*Phalacrocorax auritus)*. Hereinafter, the term blackbird will refer to the group of blackbirds as described in WS' Final Environmental Impact Statement (FEIS) (USDA 1997). These include Red-winged (*Agelaius phoeniceus*), Tricolored (*A. tricolor*), Rusty (*Euphagus carolinus*), Brewer's (*E. cyanocephalus*), and Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*), Brown-headed Cowbirds (*Molothrus ater*), Bronzed Cowbirds (*Tangavius aeneus*), Great-tailed Grackles (*Cassidix mexicanus*), and Common Grackles (*Quiscalus quiscula*).

Comments from the public involvement process were reviewed for substantive issues and alternatives which were considered in developing the Decision for the EA. After consideration of the analyses contained in the EA and review of public comments, a Decision and Finding of No Significant Impact (FONSI) were issued on April 9, 2002 for the EA. The Decision and FONSI selected Alternative 1 (proposed action) to implement an integrated damage management program in Tennessee using multiple methods to adequately address the need for bird damage management.

All bird damage management activities, including disposal requirements, are conducted consistent with: 1) the Endangered Species Act, 2) Migratory Bird Treaty Act 3) Executive Order (EO) 12898[1], EO 13045[2], EO 13112[3], and EO 13186[4], 4) the Federal Insecticide, Fungicide, and Rodenticide Act, and 5) federal, state, and local laws, regulations and policies.

Copies of the EA and Decision/FONSI are available for review from the State Director, USDA/APHIS/WS, 537 Myatt Drive, Madison, Tennessee 37115 or by visiting the APHIS website at http://www.aphis.usda.gov/wildlife_damage/nepa.shtml.

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[1] Executive Order 12898 promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies.

[2] Executive Order 13045 ensures the protection of children from environmental health and safety risks since children may suffer disproportionately from those risks.

[3] Executive Order 13112 states that each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law; 1) reduce invasion of exotic species and the associated damages, 2) monitor invasive species populations, provide for restoration of native species and habitats, 3) conduct research on invasive species and develop technologies to prevent introduction, and 4) provide for environmentally sound control, promote public education on invasive species.

[4] Executive Order 13186 directs federal agencies to protect migratory birds and strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and minimize the take of migratory birds through enhanced collaboration. A National-level MOU between the USFWS and WS is being developed to facilitate the implementation of Executive Order 13186.

2.0 Purpose

This monitoring report along with the proposed amendment to the aforementioned EA examines potential environmental impacts of WS' proposed and amended program as it relates to: 1) conducting disease surveillance in avian populations, particularly monitoring for the presence of avian influenza and West Nile virus, 2) an increase in the requests for assistance to manage bird damage in Tennessee, 3) new issues and data that have become available from public comments, research findings, and data gathering since the issuance of the 2002 Decision/FONSI and the last monitoring report, and 4) analyzes WS' bird damage management activities in Tennessee since the 2002 Decision/FONSI to ensure program activities are within the potential impact parameters analyzed in the EA.

The monitoring report and the proposed amendment to the EA are two separate analyses; however, to simplify WS' environmental processes and reduce the volume of paper those analyses are being combined into a single record. The monitoring report will pertain to the analyses of WS' bird damage management activities in Tennessee since the 2002 Decision/FONSI was signed for the EA to ensure WS' activities remain within the scope of analyses contained in the EA. The amendment to the EA will analyze the need for increasing WS' bird damage management activities along with the potential impacts to the human environment to meet those increasing needs.

Several aspects of WS' bird damage management activities have experienced an increase in the number of requests for assistance. Areas of WS' bird damage management activities experiencing an increase in requests for assistance include disease surveillance and monitoring, along with increases in requests to reduce risks associated with human safety, protection of property, and reducing or preventing agricultural damage. The increase in WS' bird damage management program analyzed in the proposed amendment would allow WS to adequately address requests as needs are identified, as requested by cooperators experiencing threats to human safety and/or damage due to birds, and as funding permits.

3.0 Proposed Amendment to the EA

A description of the need for action to address damage and threats to human safety associated with birds in Tennessee is provided in the EA (USDA 2002). Additional information related to conflicts and damage associated with resident Canada geese and Double-crested Cormorants can be found in the resident Canada Goose FEIS (USFWS 2005) and the Double-crested Cormorant FEIS (USFWS 2003) prepared by the U.S. Fish and Wildlife Service (USFWS) to manage damage associated with those species. WS continues to receive requests for assistance to manage damage and threats to human safety caused by birds in Tennessee. Since 2002, WS' has responded to requests for assistance to manage damage to property, agricultural resources, natural resources, and human safety (See Table 3.1). Damage to property caused by birds and threats to human safety are the primary reason requests for assistance are received by WS in Tennessee comprising nearly 89% of all requests received since fiscal year (FY)[5] 2002. A total of 1,198 requests for assistance have been received by the WS' program in Tennessee since FY 2002. Threats to human safety occur from threats to passenger safety at airports and from threats of disease transmission from accumulations of fecal matter in areas where contact by people is likely to occur. In FY 2006, WS received 214 requests to reduce threats to human safety caused by various bird species in Tennessee. Since FY 2002, requests for assistance to manage damage caused by birds to agricultural resources have increase nearly 142% mainly from requests for assistance to manage damage caused by vultures feeding on newborn livestock.

[5]The federal fiscal year begins on October 1 and ends on September 31 the following year.

Table 3.1 – Number of requests for assistance to manage damage caused by birds in Tennessee by fiscal year since FY 2002.

	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	Total
Property	171	204	253	367	203	1,198
Agriculture	31	30	29	66	75	231
Natural Resources	7	3	4	2	23	39
Human Safety	200	201	205	176	214	996
Total	**409**	**438**	**491**	**611**	**515**	**2,464**

Many bird species are responsible for economic damage to numerous resources and pose threats to human safety in Tennessee. Since FY 2002, over 81% of the damage reported to or verified by WS was bird damage to property (Table 3.2). Damage also continues to occur to agricultural resources, natural resources, and threatens human safety. Overall, birds were responsible for approximately $3.3 million in reported and verified damages in Tennessee from FY 2002 through FY 2006.

Table 3.2 – Reported or verified monetary damage by resource caused by birds in Tennessee from FY 2002 – FY 2006.

	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	Total
Property	150,425	302,200	1,841,485	266,950	92,045	2,653,105
Agriculture	21,485	5,950	31,800	18,340	9,575	87,150
Natural Resources	0	100	500,000	10,000	5,000	515,100
Human Safety	5,000	2,000	4,000	1,000	3,500	15,500
Total	**176,910**	**310,250**	**2,377,285**	**296,290**	**110,120**	**3,270,855**

Since the completion of the EA in 2002, the need for bird damage management has expanded to include surveillance of avian zoonoses and a need to meet an increase in assistance requests to manage damage caused by certain avian species. The need for action contained in Section 1.3 of the EA will remain as addressed and contains a complete discussion of the need for bird damage management activities in Tennessee (USDA 2002). Information provided in this monitoring report and proposed amendment to the EA will address the need for action as related to an increase in requests for assistance and for WS' increased activities to address threats from disease outbreaks with a direct or indirect link to avian species.

3.1 Disease Monitoring

Public awareness and health risks associated with avian zoonoses have increased in recent years. One of the first avian zoonosis to gain public attention was the West Nile Virus (WNV) with outbreaks of the virus first reported in the U.S. in 1999. Today, WNV has been documented to occur in all 48 conterminous U.S. states. In 2006, the CDC reported 4,269 documented cases of WNV infections in humans in 44 U.S. states with 177 deaths (CDC 2007a). In Tennessee, the CDC reported 22 cases of WNV with one death in 2006 (CDC 2007a). WS continues to provide technical assistance to those individuals requesting information on WNV and provides information on current WNV monitoring activities. WS in Tennessee is not currently actively collecting samples for WNV in the state. If a large outbreak of WNV is detected in Tennessee, WS as part of an interagency team will likely begin collecting samples from avian species as part of a disease monitoring program. This proposed amendment to the EA will address monitoring activities for WNV through collections of avian species for sampling purposes.

Another avian zoonosis gaining public awareness is the high pathogenic H5N1 avian influenza (AI) virus. AI is an influenza virus naturally occurring in birds worldwide. Many subtypes of type A influenza virus are known with subtypes differing between types of hemagglutinin (HA) and neuraminidase (NA) proteins on the surface of the influenza virus (CDC 2007b). The CDC (2007b) reports 16 known HA protein subtypes and nine known NA protein subtypes of the influenza A virus resulting in numerous possible combinations of proteins with each combination resulting in a different subtype. Birds are known to carry all known subtypes of the influenza A virus, however most subtypes of influenza A virus do not cause illness in birds (CDC 2007b). Despite a lack of clinical illness in most bird species from AI infections, AI is very contagious among birds and can cause severe illness and death in domestic birds, such as chickens, waterfowl, and turkeys (CDC 2007b).

Birds infected with AI shed the virus in saliva, nasal secretions, and feces. Infection can occur from direct contact with the bodily fluids of infected birds or from surfaces contaminated with bodily fluids of infected birds (CDC 2007b).

There are two main forms of AI infections in domestic poultry and waterfowl that are distinguished based on a high and low virulence rate. Low pathogenic AI typically goes undetected in bird species with birds showing mild symptoms, such as ruffled feathers or a reduction in egg production. High pathogenic AI is highly virulent and can spread rapidly in domestic poultry and waterfowl and can cause high mortality rates, often within 48 hours of infection (CDC 2007b).

AI refers to influenza virus infections that are found primarily in birds; however the main concern with the AI virus is that human infections are known to occur (CDC 2007b). The risk of human infection from AI viruses is low since most AI virus subtypes do not usually infect humans. However, the CDC (2007b) reports that since 1997 the infection of humans with several subtypes of AI have been documented to occur. Human contraction of AI occurs mainly from contact with infected poultry and waterfowl or from contact with contaminated surfaces. Transmission of AI viruses from human to human is thought to rarely occur.

There are three known subtypes of influenza viruses that are currently known to be circulating in the human population that are generically termed human influenza viruses. These three subtypes are H1N1, H1N2, and H3N2 influenza viruses. Current information indicates that those three subtypes of influenza virus commonly infecting humans likely originated from birds based on the genetic similarities of the human and avian influenza subtypes. The primary concern of influenza viruses is that selection processes are constantly changing the virus and that those changes may lead to an adaptation of AI viruses into highly contagious zoonoses (CDC 2007b).

The AI virus subtype of most concern in the high pathogenic H5N1 virus that occurs primarily in birds and is highly contagious with a high mortality rate in certain avian species. The CDC (2007b) reports that of the AI subtypes that are known to occasionally infect humans; the H5N1 subtype has accounted for the greatest number of detected cases in humans and caused the most severe symptoms along with the most deaths. However, the severity of symptoms and the high number of deaths attributed to H5N1 deaths increases the likelihood of reporting of the subtype compared to the milder symptoms of other AI viruses that are likely to go undiagnosed or unreported (CDC 2007b). Since 1997, reported human cases of H5N1 infections associated with outbreaks of the virus in poultry and waterfowl have occurred in Asia, parts of Europe, and Africa with more than half the reported human cases of high pathogenic H5N1 resulting in death (CDC 2007b). As stated previously, human to human transmission has been documented to occur rarely with most human infections occurring from direct contact with infected birds or from contact with surfaces contaminated by infectious birds. Despite the current inefficiency of transmission from human to human, the ability of the virus to

change from external pressures has raised the concern that the highly virulent H5N1 virus could change to a form that readily infects humans with a high likelihood of human to human transmission (CDC 2007b). Since AI subtypes do not readily infect humans, an immune response to the AI subtypes does not currently exist in the majority of the human population. If the high pathogenic H5N1 virus gains the ability to readily be transmitted from human to human, the lack of immune protection in humans could lead to a pandemic that could result in a large number of deaths (CDC 2007b).

Numerous potential routes for introduction of the virus into the U.S. exists including illegal movement of domestic or wild birds, contaminated products, and the migration of infected wild birds. Given the occurrence of high pathogenic H5N1 AI in wild birds, there is concern that migrating birds will introduce the virus into new regions of the world, including North America. Many bird species that nest in Arctic Siberia, Alaska, and Canada follow migratory flyways southward to wintering areas in the U.S., Central America and South America. Birds from both Eastern Siberia and Alaska intermingle in several of the established flyways. The overlap at the northern ends of those flyways establishes a geographic location for potential disease transmission across continents and for mixing, change and exchange of genetic material among strains from Eurasia and North America. If high pathogenic H5N1 AI virus spreads to North America by migratory birds, the virus would most likely arrive first in Alaska and spread south through the flyways by this route (USDA 2005).

Therefore, at the request of the Homeland Security Council's Policy Coordinating Committee for Pandemic Influenza Preparedness, the USDA and the U.S. Department of Interior (DOI) were requested to develop and coordinate a National Strategic Plan (USDA 2005) for early detection of high pathogenic H5N1 AI into North America by wild birds. The nationwide surveillance effort has detected some instances of low pathogenic AI viruses, as was expected given that waterfowl and shorebirds are considered to be the natural reservoirs for AI. Tens of thousands of birds have been tested, but there has been no evidence of the HP H5N1 virus in North America.

WS will continue to work as part of an interagency team in conducting surveillance for AI and WNV in bird species. Based on WS' participation in conducting disease surveillance and monitoring as part of an interdisciplinary team, WS' anticipates a need to continue efforts to monitor and detect the presence of avian zoonoses to determine threats and risks to human health and safety. This amendment to the aforementioned EA will address WS' avian disease monitoring and surveillance activities, as related to sample collecting under AI surveillance and WNV monitoring activities. Other communicable diseases addressed in section 1.3 of the EA will remain as addressed.

3.2 Requests for Assistance to Manage Damage caused by Birds

Since the completion of the EA in 2002, the number of requests WS' has received for assistance to manage damage or threats to human safety from specific bird species have increased in Tennessee. The need for action described in section 1.3 of the EA to the extent of damages caused by birds in Tennessee will remain applicable (USDA 2002). However, WS has received or reasonably anticipates an increase in requests for damage management activities for several species of birds in Tennessee. As part of the increase in requests for assistance, WS reasonably anticipates an increase in the number of birds requested to be lethally removed as part of an integrated damage management strategy to address requests to resolve or alleviate damage caused by certain bird species. WS also anticipates an increase in non-lethal harassment and dispersal of those species addressed in the proposed amendment as part of the increasing requests for assistance.

The increase in requests for assistance arose primarily from WS' involvement in managing threats to human safety at airports and an increase in the awareness of disease risks associated with bird species.

However, requests for assistance have also increased to alleviate damage to agricultural resources and damage to property in Tennessee since the completion of the EA. WS reasonably anticipates an increase in requests for assistance to manage damage caused by Rock Pigeons, Mourning Doves, Canada geese, Turkey Vultures, and Black Vultures in Tennessee.

Damage and threats posed by Rock Pigeons are primarily associated with excessive amounts of droppings, feathers, and nesting material that require extensive cleanup on a regular basis and are considered a threat to human safety. Pigeons are a gregarious species and are closely associated with human activity. Though some damage can be alleviated using exclusion and anti-perching devices, many commercial complexes requesting assistance with managing damage and threats caused by pigeons would require extensive use and maintenance of those methods to the extent that the use of those methods becomes cost prohibitive. The close association of pigeons with human activities and the gregarious behavior of pigeons can lead to large accumulations of fecal matter being deposited in areas where human activities are likely to cause direct contact with fecal matter or direct contact with surfaces contaminated by fecal matter. Fecal matter on and around a working area is also aesthetically displeasing and often requires extensive and constant cleanup. The potential for direct exposure to fecal matter from pigeons increases the risks of disease transmission which is a major concern of cooperators requesting assistance. Fecal matter accumulated on structures and property can also increase deterioration of those structures and increase repair costs. Based on an increasing awareness of zoonoses associated with birds and risks associated with direct contact with fecal matter, WS reasonably anticipates the number of requests for assistance to manage damage caused by pigeons to increase in Tennessee.

The gregarious flocking behavior of Mourning Doves during migration can pose threats to human safety and property at airports. Since 2002, strike records report aircraft struck Mourning Doves on 24 separate incidents in Tennessee (Federal Aviation Administration 2006). There have been neither reports of severe damage to aircraft in Tennessee nor reports of serious human injuries from strikes with doves in Tennessee. However, the potential for strikes to occur which leads to severe damage to property and/or threatens passenger safety have occurred from Mourning Dove strikes. In 1990, a BA-31 flew through a flock of Mourning Doves during take-off ingesting doves in both engines causing catastrophic engine failure. Cost of repairs was estimated at $1 million and time out of service was 60 hours (Cleary et al. 2006). In 2005, a Falcon 20 aircraft departing from a regional airport in Ohio hit a flock of Mourning Doves just after take-off causing an engine to flame out. A second flock was hit soon after, causing the second engine to lose power. The aircraft was damaged beyond repair and the copilot sustained minor injuries during landing. The total damage to the aircraft was estimated at $1.4 million (Cleary et al. 2006).

The presence of large concentrations of doves at airports continues to be a concern for airport authorities in Tennessee. WS continues to work with airports to manage habitat and conditions on airport property to decrease threats from doves. WS will also continue to employ non-lethal harassment and habitat modification techniques to reduce threats from large concentrations of Mourning Doves at airports in Tennessee. To decrease the likelihood of habituation, WS will continue to enhance non-lethal harassment techniques through the use of lethal methods, primarily through the use of shooting. Due to the number of requests to alleviate threats to property and human safety at airports posed by Mourning Doves, WS reasonably anticipates an increase in program activities to manage threats posed by doves.

WS continues to address damage and threats to human safety from Canada geese in Tennessee. Section 1.3 in the EA discusses the damage to agricultural resources, property, and potential threats to human safety of Canada geese in Tennessee. Further damage information and threats associated with geese can be found in the USFWS resident Canada Goose management FEIS (USFWS 2005). As

discussed in section 5.1.1.1 of the EA, most Canada geese in Tennessee are relocated to sites selected and approved by the Tennessee Wildlife Resources Agency (TWRA) and the property owner. Due to the continued increase in resident Canada Goose populations in Tennessee, the number of suitable relocation sites and the number of property owners willing to accept geese as part of a relocation program have decreased as the biological and social carrying capacity has been reached in many areas of Tennessee. Relocation sites are selected and arranged by TWRA before the capture of geese occurs. Due to a decline in the number of sites identified by TWRA and the continued requests for assistance to manage damage and threats associated with geese, WS reasonably anticipates the need to lethally remove Canada geese at the request of cooperators to increase. Canada geese will continue to be relocated as sites and properties are identified by TWRA. However, if requests for assistance to address damage and threats to human safety from geese exceed the biological and social carrying capacity of sites identified by TWRA for relocation, the number of geese to be euthanized from goose damage management activities in Tennessee may increase.

Vultures continue to cause damage to agricultural resources, property, and pose threats to human safety in Tennessee. The extent of damage caused by vultures is discussed in section 1.3 of the EA (USDA 2002). Requests for assistance to manage vulture damage have increased primarily from increased predation on livestock. Vultures often target livestock during the birthing process when livestock and newborns are vulnerable. As newborns are being expunged during birth, vultures will attack the soft tissue areas of the newborns, particularly the eyes and rectal area. Attacks on the soft tissue areas of newborns can lead to death and in some cases, the death of the female giving birth due to the stress from harassment by vultures. Black Vultures are primarily responsible for directly attacking newborns with Turkey Vultures often present once the newborn or adult have died. Since 2003, the number of requests for assistance to alleviate predation on livestock from vultures increased from 18 requests in 2003 to nearly 70 requests for assistance in 2005. WS reasonably anticipates an increase in the number of requests for assistance due to the rising incidents of livestock predation by vultures since 2002.

4.0 Summary of WS' Bird Damage Management Activities

WS provided direct damage management and technical assistance in response to requests for BDM assistance in Tennessee. Bird damage management activities conducted by WS were pursuant to the Migratory Bird Treaty Act (MBTA) under depredation orders and under depredation permits issued by the USFWS to WS or issued to other entities. The following is a summary of WS' activities to manage damage and threats caused by birds as requested by cooperators since the completion of the EA in 2002.

4.1 WS' Bird Damage Management Activities in FY 2002

The WS' program in Tennessee continued to respond to requests for bird damage management in FY 2002. WS responded to requests for assistance across a broad range of resources and bird species. Table 4.1 reflects the number of birds by species lethally removed to resolve damage to agricultural resources, natural resources, property, and to reduce threats to human health and safety. The use of DRC-1339 and shooting were the primary lethal methods used to resolve damage caused by birds. Shooting also effectively acts as a harassment and dispersal method during lethal removal and is selective for target species. Of the birds lethally removed to resolve bird damage, nearly 87% were European Starlings and Rock Pigeons in FY 2002. Starlings and pigeons were removed to alleviate damage to property, reduce threats to human health and safety, and to reduce threats of aircraft strikes. European Starlings and Rock Pigeons are considered an invasive species in the U.S. and are afforded no protection under the Migratory Bird Treaty Act. A total of 375 Mourning Doves were lethally removed to reduce threats to aircraft strikes, primarily during fall migration when large concentrations of doves migrate through Tennessee posing a strike hazard at airport facilities. All

lethal take of bird species was conducted under applicable federal and state permits in FY 2002.

Table 4.1 - Number and species of birds lethally taken by WS during damage management operations in Tennessee during FY 2002.

Species	Alpha Chloralose	DRC-1339	Avitrol	Firearm	Trap	TOTAL
Mourning Dove	0	0	0	375	0	**375**
American Crow	0	0	0	11	0	**11**
Canada Goose	19	0	0	8	21	**48**
Feral Duck	11	0	0	0	1	**12**
House Sparrow	0	0	56	1	0	**57**
Red-tailed Hawk	0	0	0	10	6	**16**
Killdeer	0	0	0	24	0	**24**
Mallard	2	0	0	12	0	**14**
Rock Pigeon	0	29	0	829	768	**1,626**
European Starling	0	3,201	0	131	0	**3,332**
Turkey Vulture	0	0	0	37	0	**37**
Great Horned Owl	0	0	0	0	1	**1**
Black Vulture	0	0	0	87	2	**89**
Northern Mockingbird	0	0	0	3	0	**3**
Ring-Billed Gull	0	0	19	0	0	**19**
House Finch	0	0	0	5	0	**5**
Feral Goose	0	0	0	0	3	**3**
Mixed Blackbirds	0	0	59	0	0	**59**
TOTAL	**32**	**3,230**	**134**	**1,533**	**802**	**5,731**

The WS' program in Tennessee continued to use non-lethal dispersal and harassment methods to alleviate and reduce damage caused by birds. In total, 109,240 birds were non-lethally harassed, dispersed, and/or relocated in Tennessee during FY 2002 (See Table 4.2). Nearly 79% of the birds dispersed or harassed were European Starlings and flocks of mixed blackbird species. Birds were primarily dispersed or relocated to alleviate damage to property, to reduce threats to human health, and to reduce hazards from aircraft strikes. Over 95% of the birds addressed by WS in FY 2002 were non-lethally harassed and/or dispersed to resolve requests for assistance.

Table 4.2 - Number and species of birds non-lethally dispersed, harassed, and/or relocated by WS during damage management operations in Tennessee during FY 2002.

Species	Total	Species	Total
Mourning Dove	5,705	Osprey	2
Mixed Blackbirds	36,032	Rock Pigeon	40
Purple Martin	5,650	European Starling	50,037
Canada Geese	713	Turkey Vulture	117
House Sparrow	14	Black Vulture	565
Red-tailed Hawk	31	Mixed Vultures	2,225
Ring-billed Gull	8,090	Great-blue Heron	1
Mallard	18	**TOTAL DISPERSED**	**109,240**

Technical assistance was also provided to those cooperators requesting information on resolving bird damage. WS conducted 438 technical assistance projects by providing information to requesters

through disseminating leaflets, demonstrations, presentations, and providing guidance on methods available to manage bird damage.

4.2 WS' Bird Damage Management Activities in FY 2003

WS continued to receive requests for assistance to conduct bird damage management activities in FY 2003 to alleviate damage and threats to human safety (See Table 4.3). Similar to FY 2002, European Starlings and Rock Pigeons were the primary focus of lethal damage management techniques using DRC-1339. Starlings and pigeons were removed primarily to alleviate damage to property and reduce threats to human safety from excessive deposits of fecal matter in areas closely associated with human activity.

Table 4.3 - Number and species of birds lethally taken by WS during damage management operations in Tennessee during FY 2003.

Species	Alpha-Chloralose	DRC-1339	Avitrol	Firearm	Trap	TOTAL
Mourning Dove	0	0	0	290	0	**292**
Common Grackle	0	0	25	0	0	**25**
American Crow	0	0	0	4	0	**4**
Canada Goose	43	0	0	49	27	**119**
Feral Goose	1	0	0	0	1	**2**
House Sparrow	0	0	76	0	0	**76**
Feral Duck	14	0	0	0	0	**14**
Red-tailed Hawk	0	0	0	7	16	**23**
Mallard	6	0	0	22	0	**28**
Rock Pigeon	0	307	0	877	738	**1,922**
European Starling	0	20,639	5	93	9	**20,746**
Turkey Vulture	0	0	0	72	0	**72**
Great Horned Owl	0	0	0	2	14	**16**
Black Vulture	0	0	0	116	0	**116**
Great Blue Heron	0	0	0	1	0	**1**
TOTAL	**64**	**20,946**	**106**	**1,533**	**805**	**23,454**

As part of an integrated damage management program, WS used non-lethal dispersal and harassment methods to alleviate and reduce damage caused by birds. In total, 157,821 birds were non-lethally harassed, dispersed, and/or relocated in Tennessee during FY 2003 (See Table 4.4). Over 90% of the birds dispersed or harassed were European Starlings. Birds were primarily dispersed or relocated to alleviate damage to property, to reduce threats to human health, and to reduce hazards from aircraft strikes. Similar to FY 2002, WS dispersed, harassed, and/or relocated over 87% of the birds address in FY 2003. Non-lethal harassments and dispersal methods used are discussed in detail in the EA.

Table 4.4 - Number and species of birds non-lethally dispersed, harassed, and/or relocated by WS during damage management operations in Tennessee during FY 2003.

Species	Total	Species	Total
Mourning Dove	3,769	Red-winged Blackbird	50
Common Grackle	1,400	Mallard	19
American Crow	700	Mixed Blackbird	2,500
Canada Geese	1,756	Rock Pigeon	1,147
House Sparrow	28	European Starling	142,315
Brown-headed Cowbird	200	Black Vulture	733
Red-tailed Hawk	20	Mixed Vulture	3,184
		TOTAL DISPERSED	**157,821**

Technical assistance was also provided to those cooperators requesting information on resolving bird damage. WS conducted 439 technical assistance projects by providing information to requesters through disseminating leaflets, demonstrations, presentations, and providing guidance on methods available to manage bird damage.

4.3 WS' Bird Damage Management Activities in FY 2004

The WS' program lethally removed a total of 5,293 individual birds of 15 species while conducting operational management projects during FY 2004 in Tennessee (See Table 4.5). Similar to previous years, European Starling and Rock Pigeons comprised nearly 93% of the lethal take of birds. As stated previously, starling and pigeons are considered a non-native, invasive species in the U.S. and afforded no protection under the Migratory Bird Treaty Act. Take of starlings occurred primarily using DRC-1339 while the take of pigeon occurred using multiple methods.

Table 4.5 - Number and species of birds lethally taken during damage management operations by WS in Tennessee during FY 2004.

Species	Alpha Chloralose	DRC-1339	Avitrol	Firearm	Trap	TOTAL
House Finch	0	0	0	9	0	**9**
Collared Dove	0	0	0	39	0	**39**
Canada Goose	47	0	0	22	37	**106**
Feral Duck	22	0	0	0	0	**22**
Red-tailed Hawk	0	0	0	1	52	**53**
American Kestrel	0	0	0	0	3	**3**
Snow Goose	0	0	0	1	0	**1**
Mallard	9	0	0	9	0	**18**
Ring-Billed Gull	0	0	19	0	0	**19**
Rock Pigeon	0	737	0	656	580	**1,973**
European Starling	0	2,930	0	12	0	**2,942**
Turkey Vulture	0	0	0	44	0	**44**
Great Horned Owl	0	0	0	0	4	**4**
Black Vulture	0	0	0	51	0	**51**
Feral Goose	0	0	0	0	9	**9**
TOTAL	**78**	**3,667**	**19**	**844**	**685**	**5,293**

The number of birds lethally removed in FY 2004 dropped primarily due to a reduction in starling damage management activities. Several ongoing starling projects terminated once the number of

starlings and damage were reduced to levels acceptable to cooperators resulting in a reduced need for starling damage management activities in FY 2004.

Additionally, 135,220 individual birds from at least 12 species were non-lethally harassed, dispersed, and moved from areas where damage was occurring in Tennessee (See Table 4.6). Ring-billed gulls, blackbirds, and starlings were the primary bird species harassed as part of an integrated damage management program to alleviate damage. Birds were primarily dispersed or relocated to alleviate damage to property, to reduce threats to human safety, and to reduce hazards from aircraft strikes. Of the 140,513 birds addressed as part of WS' activities in FY 2004, over 96% were dispersed, harassed, and/or relocated as part of an integrated damage management program. Nearly 88% of the starlings addressed were dispersed or harassed to resolve requests for assistance.

Table 4.6 - Number and species of birds non-lethally dispersed, harassed, and/or relocated by WS during damage management operations in Tennessee during FY 2004.

Species	Total	Species	Total
Mourning Dove	2,456	Osprey	14
Mixed Blackbirds	24,650	Rock Pigeon	533
Brown-headed Cowbird	21,900	European Starling	21,480
Ring-billed Gull	61,061	Turkey Vulture	51
Canada Geese	1,221	Black Vulture	153
Red-tailed Hawk	103	Mixed Vultures	1,569
Mallard	5	Great Blue Heron	24
		TOTAL DISPERSED	**135,220**

WS completed 470 technical assistance projects regarding bird damage management in Tennessee during FY 2004. Technical assistance provided interested cooperators with information on managing bird damage, including the proper use of methods to alleviate damage.

4.4 WS' Bird Damage Management Activities in FY 2005

The WS' program in Tennessee continued to implement an integrated damage management program in response to requests for bird damage in FY 2005. Table 4.7 reflects the number of birds by species lethally removed by method to resolve damage to agricultural resources, natural resources, property, and to reduce threats to human health and safety in Tennessee during FY 2005. The use of traps and shooting were the primary lethal method used to resolve damage caused by birds. Of the birds lethal removed to resolve bird damage, over 67% were Rock Pigeons in FY 2005. Large roosting flocks of pigeons can leave accumulations of fecal matter that can lead to extensive repairs of structures, require continuous clean-up, and can pose a human health threat from exposure to fecal matter in areas where people are present. Fecal matter from roosting or nesting pigeons that covers public use areas can also be visually and olfactorily displeasing.

In FY 2005, the number of requests for assistance to manage damage to agricultural resources and property from vultures increased. The level of take required to adequately resolve requests to alleviate damage increased over 500% in FY 2005 compared to FY 2004 in Tennessee. FY 2005 also saw an increase in the number of requests for assistance to manage predation of livestock from vultures and also from direct damage to structures from roosting vultures. Vultures often pull shingles and other materials from building where roosting occurs causing damage to property.

Table 4.7 - Number and species of birds lethally taken by WS during damage management operations in Tennessee during FY 2005.

Species	Alpha Chloralose	DRC-1339	Avitrol	Egg/nest destruction	Firearm	Trap	TOTAL
Mourning Dove	0	0	0	0	39	12	**51**
Collared Dove	0	0	0	0	19	0	**19**
Common Grackle	0	0	71	0	0	0	**71**
Canada Goose	54	0	0	43	10	80	**187**
Feral Duck	4	0	0	0	0	0	**4**
House Sparrow	0	0	4	39	3	34	**80**
Sharp-Shinned Hawk	0	0	0	0	1	0	**1**
Red-tailed Hawk	0	0	0	0	1	0	**1**
American Kestrel	0	0	0	0	0	1	**1**
Killdeer	0	0	0	0	6	0	**6**
Mallard	0	0	0	0	17	1	**18**
Rock Pigeon	0	471	0	0	794	918	**2,183**
European Starling	0	0	0	0	11	0	**11**
Turkey Vulture	0	0	0	0	37	193	**230**
Black Vulture	0	0	0	0	53	324	**377**
Great Blue Heron	0	0	0	0	4	0	**4**
TOTAL	**58**	**471**	**75**	**82**	**995**	**1,563**	**3,244**

WS continued to use an integrated damage management program using non-lethal methods in FY 2005. A total of 17,056 individual birds from at least 11 species were non-lethally harassed, dispersed, and/or moved from areas where damage was occurring in Tennessee (See Table 4.8). Similar to previous years, WS' used non-lethal methods to address 84% of the birds associated with damage to resources and threats to safety in Tennessee during FY 2005. European Starlings, Canada geese, and blackbirds were the primary bird species harassed or relocated as part of an integrated damage management program. Birds were primarily dispersed or relocated to alleviate damage to property, to reduce threats to human safety, and to reduce hazards from aircraft strikes. The program completed 358 technical assistance projects regarding bird damage management in FY 2005.

Table 4.8 - Number and species of birds non-lethally dispersed, harassed, and/or relocated by WS during damage management operations during FY 2005.

Species	Total	Species	Total
Mourning Dove	520	Rock Pigeon	307
Mixed Blackbirds	3,200	European Starling	6,085
Canada Goose	4,685	Turkey Vulture	22
Red-tailed Hawk	9	Mixed Vultures	2,121
Killdeer	7	Black Vulture	100
		TOTAL DISPERSED	**17,056**

4.5 WS' Bird Damage Management Activities in FY 2006

Table 4.9 reflects WS' bird damage management activities using lethal methods to resolve damage associated with those species of birds listed. As part of an integrated damage management strategy, WS employed lethal methods to compliment non-lethal dispersal and harassment techniques during FY 2006. Rock Pigeons and Black Vultures were the two primary species for which lethal methods were used to manage damage caused by those species in FY 2006. The gregarious behavior of

roosting Rock Pigeons cause extensive damage to property from accumulations of droppings which can accelerate weathering and increase costs of clean up activities. Large concentrations of fecal matter are also aesthetically displeasing and can pose a threat to human safety in areas where human activities may lead to contact with fecal matter or surfaces contaminated from fecal matter. Vultures were primarily removed to alleviate damage to livestock from predation and from damage to structures.

Table 4.9 - Number and species of birds lethally taken by WS during damage management operations in Tennessee during FY 2006.

Species	Alpha Chloralose	DRC-1339	Avitrol	Egg/nest destruction	Firearm	Trap	TOTAL
Mourning Dove	0	0	0	0	694	28	**722**
Collared Dove	0	0	0	0	26	9	**35**
Common Grackle	0	0	34	0	10	0	**44**
Canada Geese	31	0	0	48	15	9	**103**
Feral Duck	6	0	0	0	0	0	**6**
Great Horned Owl	0	0	0	0	0	3	**3**
Green Heron	0	0	0	0	3	0	**3**
American Crow	0	0	0	0	6	0	**6**
Osprey	0	0	0	1	0	0	**1**
Blue-Winged Teal	0	0	0	0	4	0	**4**
House Finch	0	0	0	0	3	0	**3**
Cooper's Hawk	0	0	0	0	1	0	**1**
Red-tailed Hawk	0	0	0	0	4	9	**13**
American Kestrel	0	0	0	0	2	2	**4**
Killdeer	0	0	0	0	12	0	**12**
Mallard	0	0	0	0	15	0	**15**
Rock Pigeon	0	737	0	16	1,500	1,292	**3,545**
European Starling	0	0	0	0	89	0	**89**
Turkey Vulture	0	0	0	0	34	141	**175**
Black Vulture	0	0	0	0	169	1,073	**1,242**
Great Blue Heron	0	0	0	0	2	0	**2**
TOTAL	**37**	**737**	**34**	**65**	**2,589**	**2,566**	**6,028**

WS continued to use dispersal, harassment, and relocation as part of an integrated damage management program in FY 2006. WS used harassment and relocation to disperse at total of 33,812 individual birds in Tennessee during FY 2006 (See Table 4.10). Similar to FY 2005, approximately 85% of the birds addressed to resolve damage and threats to human safety in FY 2006 were non-lethally dispersed or relocated. European Starlings were the primary bird species harassed as part of an integrated damage management program to alleviate damage. Birds were primarily dispersed or relocated to alleviate damage to property, to reduce threats to human safety, and to reduce hazards from aircraft strikes. In FY 2006, WS conducted 363 technical assistance projects to assist cooperators with managing damage caused by birds.

Table 4.10 - Number and species of birds non-lethally dispersed, harassed, and/or relocated by WS during damage management operations in Tennessee during FY 2006.

Species	Total	Species	Total
Mourning Dove	2,125	American Kestrel	4
Collared Dove	40	House Finch	1
Mixed Blackbirds	6,450	Mallard	38
Brown-headed Cowbird	70	Rock Pigeon	2,118
American Crow	94	European Starling	17,775
Northern Shoveler	5	Turkey Vulture	4
Canada Goose	3,184	Mixed Vultures	653
Feral Duck	10	Black Vulture	1,188
Ring-necked Duck	31	Great Blue Heron	2
Red-tailed Hawk	20	**TOTAL DISPERSED**	33,812

5.0 Relationship of this Environmental Assessment to Other Environmental Documents

The EA, this report, and the proposed amendment are tiered[6] to the following documents with pertinent information incorporated into this document by reference.

5.1 ADC[7] Programmatic Final Environmental Impact Statement

WS has developed a programmatic Final Environmental Impact Statement (FEIS) that analyzes and addresses potential environmental impacts from various wildlife damage management methods employed by WS (USDA 1997). WS' FEIS may be obtained by contacting: USDA-APHIS-WS, Operational Support Staff, 4700 River Rd., Unit 87, Riverdale, MD 20737-1234.

5.2 Resident Canada Goose Management Final Environmental Impact Statement

The USFWS has issued a FEIS addressing the need for and potential environmental impacts associated with resident goose damage management activities entitled "*Resident Canada Goose Management*" (USFWS 2005). The FEIS also contains detailed analyses of the issues and methods used to manage Canada Goose damage. The FEIS may be obtained by contacting the Division of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, MBSP-4107, Arlington, Virginia 22203 or by downloading it from the USFWS website at http://www.fws.gov/migratorybirds/issues/cangeese/finaleis.htm. A Record of Decision (ROD) and Final Rule were published by the USFWS on August 10, 2006 (Federal Register Vol. 71, No. 154: 45964- 45993). On June 27, 2007, WS, as a cooperating agency, issued a Record of Decision and adopted the USFWS FEIS (Federal Register Vol. 72, No. 123: 35217).

5.3 Double-crested Cormorant Management Final Environmental Impact Statement

The USFWS has also issued a FEIS on the management of damage caused by Double-crested

[6]Council on Environmental Quality (CEQ) regulations encourage federal agencies to tier Environmental Assessments to previously prepared Environmental Impact Statements and to incorporate material by reference in order to reduce the volume of National Environmental Policy Act (NEPA) documents (40 CFR 1502.20, 40 CFR 1502.21).

[7]On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The terms Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this document.

Cormorants (DCCO) (USFWS 2003). WS was a formal cooperating agency in the preparation of the FEIS and has adopted the EIS to support WS' program decisions for its involvement in the management of DCCO damage. WS completed a Record of Decision (ROD) on December 5, 2003 (Federal Register Vol. 68, No. 234:68020). The FEIS may be obtained by contacting the Division of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, MBSP-4107, Arlington, Virginia 22203 or by downloading it from the USFWS website at http://migratorybirds.fws.gov/issues/cormorant/cormorant.html.

6.0 Site Specificity

The EA and this amendment analyzes the potential impacts of BDM and addresses activities on all public and private lands in Tennessee under Memorandum of Understandings (MOU), Cooperative Agreements, and in cooperation with the appropriate public land management agencies. Since the location and timing of damage can not be predicted in all cases, the EA and this amendment addresses the impacts of BDM in areas where additional agreements may be signed in the future. The goal of WS is to reduce damage when requested, within the constraints of available funding and workforce. Therefore, WS reasonably anticipates requests for additional BDM efforts are likely to occur. Thus, the EA and this proposed amendment anticipates this potential expansion and analyzes the impacts of such efforts.

Planning for the management of bird damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Bird damage or threats to human safety can be predicted at some location such as airports, industrial sites, or to specific natural resources. However, all specific locations or times where such damage will occur in any given year cannot be predicted. The EA and this amendment emphasize major issues as they relate to specific areas whenever possible, however, many issues apply wherever bird damage and resulting management occurs, and are treated as such. The standard WS' Decision Model would be the site-specific procedure for individual actions conducted by WS in Tennessee (Slate et al. 1992, USDA 1997, USDA 2002). WS uses a decision model based on a publication by Slate et al. (1992) which involves evaluating each request for assistance, taking action and evaluating and monitoring results of the actions taken. The published article provides more detail on the processes used in the WS' Decision Model. WS' FEIS (USDA 1997), to which the EA is tiered, provides more detail and examples of how the model is used. WS' personnel use the Decision Model to develop the most appropriate strategy to reduce damage and to determine potential environmental effects from damage management actions (Slate et al. 1992, USDA 1997, USDA 2002).

The analyses in the EA and this amendment are intended to apply to any action that may occur *in any locale* and at *any time* within the state of Tennessee. In this way, WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish WS' mission of responding to requests for assistance.

7.0 Authority and Compliance

WS' activities to manage bird damage in Tennessee are regulated by federal, state, and local laws and regulations. The authority of WS and compliance with relevant laws and regulations are discussed in detail in section 1.7 of the EA (USDA 2002). WS' activities are also conducted consistent with relevant Executive Orders which were discussed in section 1.0 of this report and proposed amendment. Compliance with laws and regulations not directly addressed in the EA will be discussed in this report and proposed amendment.

7.1 Investigational New Animal Drug (INAD)

The Food and Drug Administration (FDA) grants permission to use investigational new animal drugs [21 Code of Federal Regulations (CFR), Part 511]. The sedative drug alpha-chloralose is registered with the Food and Drug Administration to capture waterfowl, coots, and pigeons. The use of alpha-chloralose by WS was authorized by the FDA through approval under the Investigational New Animal Drug which allows use of the drug as a non-lethal form of capture. Alpha-chloralose as a method for resolving bird damage and threats to human safety are discussed in Appendix B of the EA (USDA 2002).

7.2 Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970 and its implementing regulations (29 CFR 1910) on sanitation standards states that, "*Every enclosed workplace shall be so constructed, equipped, and maintained, so far as reasonably practical, as to prevent the entrance or harborage of rodents, insects, and other vermin. A continuing and effective extermination program shall be instituted where their presence is detected*." This standard includes birds that may cause safety and health concerns at workplaces.

7.3 The Native American Graves and Repatriation Act of 1990

The Native American Graves Protection and Repatriation Act requires federal agencies to notify the Secretary of the Department that manages the federal lands upon the discovery of Native American cultural items on federal or tribal lands. Federal projects would discontinue work until a reasonable effort has been made to protect the items and the proper authority has been notified.

7.4 National Historic Preservation Act of 1966 (NHPA), as amended

The NHPA of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that has the potential to cause effects on historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the Advisory Council on Historic Preservation (*i.e.*, State Historic Preservation Office, Tribal Historic Preservation Officers), as appropriate. WS' actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties.

Each method described in the EA and this amendment that might be used operationally by WS does not cause major ground disturbance, does not cause any physical destruction or damage to property, does not cause any alterations of property, wildlife habitat, or landscapes, and does not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used by WS under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

There is potential for audible affects on the use and enjoyment of a historic property when methods such as firearms or dispersal methods are used at or in close proximity to such sites for purposes of removing animals. However, such methods would only be used at a historic site at the request of the owner or manager of the site to resolve a damage or nuisance problem, which means such use would be to the benefit of the historic property. A built-in mitigating factor for this issue is that virtually all

of the methods involved would only have temporary effects on the audible nature of a site and can be ended at any time to restore the audible qualities of such sites to their original condition with no further adverse effects. Site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary in those types of situations.

8.0 Environmental Status Quo

As defined by NEPA implementing regulations, the "*human environment* shall be interpreted comprehensively to include the natural and physical environment *and the relationship of people with that environment*" (40 CFR 1508.14). Therefore, when a federal action agency analyzes its potential impacts on the "human environment," it is reasonable for that agency to compare not only the effects of the federal action, but also the potential impacts that occur or will occur in the absence of the federal action. This concept is applicable to situations involving federal assistance in managing damage associated with unprotected wildlife species.

Unprotected wildlife species, such as most non-native invasive species, are often not protected under state or federal law. Most state-resident wildlife species are managed under the authority of the states without any federal oversight or protection. In some states, with the possible exception of restrictions on methods (e.g., firearms restrictions, pesticide regulations), unprotected wildlife species and certain resident wildlife species are managed with little or no restrictions allowing them to be killed or taken by anyone at any time.

When a non-federal entity takes a management action on an unregulated state-resident wildlife species or unprotected invasive species, the action is not subject to NEPA compliance due to the lack of federal involvement in the action. Under such circumstances, the environmental *baseline* or *status quo* must be viewed as an environment that includes those species *as they are managed or impacted by non-federal entities in the absence of the federal action being proposed*. Therefore, in those situations in which a non-federal entity has decided that a management action directed towards a state protected or unprotected wildlife species will occur and even the particular methods that will be used, WS' involvement in the action will not affect the *environmental status quo*. WS' decision-making ability is restricted to one of two alternatives - either taking the action using the specific methods as determined and agreed upon by the non-federal entity, or taking no action at all at which point the non-federal entity may take the same action anyway since many methods available to WS are also available to other entities.

Therefore, based on the discussion above, it is clear that in those situations where a non-federal cooperator has already made the decision to remove or otherwise manage bird species not afforded protection under the MBTA or state regulations, WS participation in carrying out the action will not affect the *environmental status quo*. In some situations, however, certain aspects of the human environment may actually benefit more from WS' involvement than from a decision not to assist. For example, if a cooperator believes WS has greater expertise to selectively remove a target species than a non-WS entity; WS' management activities may have less of an impact on target and non-target species than if the non-federal entity conducted the action alone. Thus, in those situations, WS' involvement may actually have a *beneficial* effect on the human environment when compared to the *environmental status quo* in the absence of such involvement.

9.0 Alternatives Analyzed in Detail

The alternatives considered and evaluated using the identified issues are described and discussed in detail in Chapter 4 of the EA (USDA 2002). The EA describes four potential alternatives that were developed to address the issues identified above. Alternatives analyzed in detail include:

1. Continue the Current Federal BDM Program (No Action/Proposed Action)
2. Non-lethal BDM Only by WS
3. Technical Assistance Only
4. No Federal WS' BDM

Three additional alternatives were considered but not analyzed in detail in the EA. WS has reviewed the alternatives not analyzed in detail in the EA and has determined that the analyses provided in the EA have not changed and are still appropriate.

10.0 Issues Addressed

The major issues are discussed in detail in Chapter 2 of the EA (USDA 2002). In addition to the identified major issues considered in detail, ten other issues were considered but not in detail. WS has reviewed those issues not considered in detail as described in the EA and has determined that the analyses provided in the EA are still appropriate regarding those issues.

Potential impacts of Alternatives 2, 3 and 4 on the human environment related to the major issues have not changed from those described in the EA and thus do not require additional analyses in this report or the proposed amendment. Chapter 5 of the EA contains a detailed discussion and comparison of the identified alternatives and the major issues (USDA 2002). The issues were identified as important to the scope of the analysis in the EA (40 CFR 1508.25). Alternative 1 (proposed action/no action), as described in the EA, addresses requests for bird damage management in Tennessee using an integrated damage management approach by WS. The following is an analysis of potential impacts for each of the major issues analyzed in the EA as related to Alternative 1:

10.1 Issue 1 - Effects on wildlife including target, non-target, and T&E species.

The issue of the effects on target and non-target species, including T&E species, arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently capture or kill non-target wildlife while targeting specific bird species. WS' mitigation measures and SOPs are designed to reduce the effects on non-target species' populations and are discussed in section 4.4 of the EA (USDA 2002). To reduce the risks of adverse affects to non-target wildlife, WS would select damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of capturing non-target species. Before initiating management activities, WS would select locations which are extensively used by the target species and use baits or lures which are preferred by those bird species.

10.1.1 Effects on Target Bird Species

The analysis for magnitude of impact on populations generally follows the process described in Chapter 4 of USDA (1997). Magnitude is described in USDA (1997) as "*...a measure of the number of animals killed in relation to their abundance*." Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. WS' take is monitored by comparing numbers of animals killed with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (USDA 1997).

10.1.1.1 Breeding Bird Survey

Bird populations can be monitored by using trend data from the Breeding Bird Surveys (BBS) which are conducted annually in the U.S., across a large geographical area, under standardized survey guidelines. The BBS is a large-scale inventory of North American birds coordinated by the U.S. Geological Survey, Patuxent Wildlife Research Center (Sauer et al. 2006). The BBS is a combined set of over 3,700 roadside survey routes primarily covering the continental U.S. and southern Canada. The BBS was started in 1966 with routes surveyed in June by experienced birders. The primary objective of the BBS has been to generate an estimate of population change for all breeding birds. Populations of birds tend to fluctuate, especially locally, as a result of variable local habitat and climatic conditions. Trends can be determined using different population equations and statistically tested to determine if a trend is significant.

Estimates of population trends from BBS data are derived primarily from route-regression analysis (Geissler and Sauer 1990) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is reflected in the calculated P-value (i.e., the probability of obtaining the observed data or more extreme data given that a hypothesis of no change is true). The level of statistical significance (e.g, 0.01, 0.05, 0.10) can vary and is often set by those conducting the analysis. Often BBS or other geographically large survey (e.g., Christmas Bird Count, Breeding Plot Survey) data is not statistically significant at the local level because of relatively smaller sample size (i.e., fewer routes surveyed), more routes with zero observations of a particular bird species which results in larger statistical variance, and low P-values set for statistical significance. The BBS has a statistical level of significance set at $P<0.01$.

The BBS data is best used to monitor population trends. However, the average number of birds per route (relative abundance) can be used to theoretically estimate the population size (relative abundance/10 mi^2 x 42,169 mi^2 (total land/water area in Tennessee). To use these population estimates the following assumptions would need to be accepted.

- All birds within a quarter mile of the observer are seen at all stops on a BBS route; this assumption is faulty because observers often cannot see a quarter mile in radius at all stops due to obstructions such as hills, trees, and brush and because some bird species can be very elusive. Therefore, the number of birds seen per route would provide a conservative estimate of the population.
- The chosen survey routes are totally random and are fully representative of available habitats. When BBS routes are established, survey rules allow the observers to make stops for surveys based on better quality habitat or convenient parking areas, even though the survey sites are supposed to be spaced a half-mile apart. Therefore, if survey areas had stops with excellent food availability, the count survey could be biased. This would tend to overestimate the population. However, if these sites were not on a route at all, the population could be underestimated.
- Birds are equally distributed throughout the survey area and routes were randomly selected. Routes are randomly picked throughout the state, but are placed on the nearest available road. Therefore, the starting point is picked for accessibility by vehicle. However, a variety of habitat types are typically covered since most BBS routes are selected because they are away from large concentrations of human habitation to allow observers to hear birds without interruption from vehicular noise.

10.1.1.2 Christmas Bird Count

The Christmas Bird Count (CBC) is conducted in December and early January annually by numerous volunteers under the guidance of the National Audubon Society (NAS). The CBC reflects the number of birds frequenting the state during the winter months. The CBC data does not provide a population estimate, but can be used as an indicator of trends in the population. Researchers have found that population trends reflected in CBC data tend to correlate well with those from censuses taken by more stringent means (NAS 2006).

BBS trend data (Sauer et al. 2006) and CBC trend data (NAS 2006) are presented in Table 10.1 for those species that were lethally taken during WS' damage management activities from FY 2002 to FY 2006.

Table 10.1 - Breeding Bird Survey and Christmas Bird Count trend data from 1966-2005 for bird species lethally taken in Tennessee from FY 2002 through FY 2006.

Species	Tennessee BBS	Eastern U.S. BBS	U.S. BBS	BBS Survey-wide	Tennessee CBC	U.S. CBC
Great Blue Heron	11.6%	2.5%	2.5%	1.7%	increasing	increasing
Green Heron	-2.0%	-1.3%	-1.1%	-1.1%	n/a*	variable
Black Vulture	10.0%	2.7%	3.2%	3.2%	increasing	increasing
Turkey Vulture	3.2%	3.6%	1.5%	1.8%	increasing	increasing
Canada Goose	11.8%	16.7%	7.6%	8.2%	increasing	increasing
Snow Goose	n/a	n/a	n/a	n/a	variable	increasing
Mallard	7.2%	2.5%	2.5%	0.7%	variable	variable
Blue-winged Teal	n/a	-2.7%	0.2%	-0.6%	stable	stable
Osprey	n/a	5.5%	6.3%	6.1%	variable	increasing
Sharp-shinned Hawk	19.9%	1.9%	2.9%	2.1%	increasing	increasing
Cooper's Hawk	4.0%	7.8%	6.8%	6.0%	increasing	increasing
Red-tailed Hawk	3.25	3.3%	2.5%	2.3%	increasing	increasing
American Kestrel	3.8%	-0.1%	-0.1%	-0.2%	increasing	stable
Killdeer	1.2%	0.3%	0.1%	-0.5%	variable	stable
Ring-billed Gull	n/a	2.1%	2.0%	1.5%	increasing	stable
Rock Pigeon	-0.8%	-0.1%	-0.4%	-0.1%	increasing	increasing
Eurasian Collared Dove	48.3%	29.3%	54.4%	54.1%	increasing	increasing
Mourning Dove	-0.6%	0.5%	-0.2%	-0.1%	increasing	increasing
Great-horned Owl	-1.9%	-1.4%	-0.1%	-0.3%	variable	stable
American Crow	0.1%	0.9%	1.0%	0.8%	variable	increasing
Northern Mockingbird	-0.4%	-0.8%	-0.6%	-0.6%	stable	stable
European Starling	0.7%	-0.9%	-0.6%	-0.9%	stable	declining
Red-winged Blackbird	0.0%	-1.4%	-0.8%	-0.9%	variable	declining
Common Grackle	-3.0%	-1.2%	-1.2%	-1.1%	stable	declining
Brown-headed Cowbird	-1.5%	-1.8%	-0.9%	-1.2%	declining	stable
House Finch	17.6%	9.3%	0.6%	0.9%	increasing	increasing
House Sparrow	-2.5%	-2.8%	-2.6%	-2.6%	declining	declining

*Information is unavailable due to timing of surveys and the absence of individuals of those species during surveys in the state or region (e.g., Snow geese do not breed in Tennessee and therefore would not appear on the BBS).

The EA concluded that the effects of WS' damage management activities in Tennessee would not negatively impact the overall survival of those populations of bird species addressed in the EA when damage management activities occurred within the scope analyzed. WS' lethal take of bird species to alleviate damage and threats to human safety were within the estimated level of lethal

take analyzed in the EA from FY 2002 through FY 2006, except for take of Rock Pigeons that occurred in FY 2006 and the lethal take of vultures, primarily Black Vultures that occurred in FY 2005 and FY 2006. WS' damage management activities were site specific, and although local populations of target bird species may have been reduced, there was no probable adverse impact on statewide, regional, or national populations of those species from WS' activities from FY 2002 through FY 2006. The potential impacts of program activities on target bird species have not changed from those analyzed in the EA. All take occurred under a depredation permit issued by the USFWS pursuant to the MBTA. Requests for WS' assistance in Tennessee are expected to increase based on the need for enhanced disease monitoring and surveillance and from an increase in requests to manage damage to property, agricultural resources, and from threats to human safety.

The following is a population analysis of potential impacts resulting from an anticipated increase in assistance requests to manage damage caused by Canada geese, vultures, Rock Pigeons and birds taken for disease monitoring purposes that are being proposed as part of the amendment to the EA.

10.1.2 Vulture population effects

The BBS is the primary source of information on population change and relative abundance for many North American bird species (Sauer et al. 2004). Survey results are used for a variety of conservation activities including setting harvest regulations for Mourning Doves (Sauer et al. 1994) and developing management plans for regional conservation initiatives such as Partners in Flight (Carter et al. 2000). Surveys, such as the BBS, form the primary sources of information on population change (Link and Sauer 1998). The CBC also provides trend information that can be used in conjunction with the BBS data to gauge overall population trends.

The BBS and CBC data are the primary survey instruments used by the USFWS, U.S. Geological Survey (USGS), and WS for monitoring vulture and other bird populations. The trend information available from the BBS and CBC has been used since the 1980s to detect declines in bird species abundance and since 1994 to estimate population trends (Peterjohn 1994). While flaws in the BBS are well documented (Sauer et al. 2006) it remains one of the best survey instruments available for most bird species. Actual population estimates for a vast majority of the approximately 650 bird species in North America would be difficult to obtain due to the logistical and labor intensive requirements of conducting a survey over a large geographical area under standardized survey methods that may require survey methods being tailored to specific bird species to ensure appropriate estimates (Link and Sauer 1998). Therefore, government agencies, conservation organizations, and others must rely on existing survey instruments to monitor the status of individual bird populations. Long-term surveys are appropriate for detecting broad population trends, including trends for vultures (Kirk and Mossman 1998, Kiff 2000).

The difficulties in surveying Black Vultures and Turkey Vultures has led to a debate over the current population status of vultures and the proper survey methods to accurately estimate populations. Brown (1976) and Blem (1995) both reported Black Vultures and Turkey Vultures have been declining in abundance based on CBC trend data. Whereas, Peterjohn and Sauer (1993) report a statistically significant population increase for Black Vultures and a stable population for Turkey Vultures during the period 1966 through 1991 from BBS trend data. Wilbur (1983) cautioned against drawing conclusions regarding the status of vultures until more precise data was collected. Rabenhold and Decker (1989) stated that the CBC under-represented Back Vulture abundance due to the mode of flight of the species. Sweeney and Fraser (1986) also concluded that the CBC was an inappropriate method for surveying vultures and reported the most appropriate way to survey vulture

abundance was counting individuals at the roost.

WS uses the best available information to produce reasonable trends and estimates from the BBS and CBC data, along with other published literature. BBS and CBC survey data is derived from surveyors identifying bird species based on visual and auditory cues. Vultures produce very few auditory cues that would allow for identification (Buckley 1999) and thus, surveying for vultures is reliant upon visual identification. For visual identification to occur during surveys vultures must be either flying or visible while roosting. Coleman and Fraser (1989) estimated that Black and Turkey Vultures spend 12 - 33% of the day in summer and 9 - 27% of the day in winter flying. Most vultures during surveys are counted while flying since counting at roosts can be difficult due to obstructions limiting sight and due to the constraints of boundaries used during the surveys, especially the BBS survey since observers are limited to counting only those bird species within a quarter mile of the survey point. Bunn et al. (1995) reported vulture activity increased from morning to afternoon as temperatures increased. Therefore, surveys for vultures should occur later in the day to increase the likelihood of vultures being observed by surveyors. Observations conducted for the BBS are initiated in the morning since mornings tend to be periods of high bird activity. Since vulture activity tends to increase from morning to afternoon when the air warms and vultures can find thermals for soaring, vultures are probably under-represented in BBS data.

The CBC survey also has several limitations but can be an appropriate survey instrument for detecting broad population trends for vultures (Kirk and Mossman 1998, Kiff 2000). Given that population estimates are not currently available for vultures, the trend data available from CBC allows gauging of impacts based on trend information and allows for potential impacts to be analyzed. One limitation of the CBC occurs when factoring in that observation sites may change from year to year. However, the CBC is a 24-hour survey thus it can count vultures throughout the day and is less affected by time-related variations in vulture activity than surveys that count only during a smaller time frame of the day. This can be important as turkey vultures are more numerous in the afternoon than in the morning (Bunn et al. 1995).

The CBC provides an indication of population trends, not an estimate of actual population levels. When used properly, CBC data can reveal important changes in the status of a species' population across a broad area that would otherwise be undetectable. Counts at individual roosts can reveal the status of local populations, but roost counting lacks the consistent, long term, broad geographical coverage of the CBC. Sweeney and Fraser (1986) described the CBC as inappropriate for monitoring vulture populations because they found only weak correlations between roost counts and nearby roadside surveys. This conclusion is expected given that after vultures depart a roost, they can disperse over a broad area, and there is no reason to expect a strong correlation between the number of birds departing a roost in early morning and the number counted during a roadside survey conducted hours later. A count at a roost is a point count whereas a survey along a road transect potentially includes birds from multiple roosts over a broad area. Furthermore, there currently is no systematic survey of vulture roosts in Tennessee or in any other state. Thus, despite possible shortcomings, and imperfections, the CBC data remains the best source of information on winter statewide vulture population trends.

Vultures are protected by the MBTA and take is regulated by the USFWS through a permitting process pursuant to the MBTA. The take of vultures by WS in Tennessee occurs in accordance with applicable state and federal laws and regulations, including the USFWS and the TWRA permitting processes, which authorize the take of migratory birds and their nest and eggs. The USFWS, as the agency with management responsibility of bird populations in the U.S., could impose restrictions on the take of vultures under depredation permits as needed to assure cumulative take does not adversely affect the continued viability of populations. The analysis of cumulative take conducted by the

USFWS assures that no significant adverse impacts occur to vulture populations. The number of depredation permits issued by the USFWS, including the authorized and reported take, for the state of Tennessee from 2002 - 2006 is provided in Table 10.2.

Many landowners and land managers obtain permits initially and then stop renewing the permits because they believe the permit process is burdensome (Lowney 1999). Thus, the number of permits issued annually fails to show the magnitude of the vulture damage problem. Also, many people with vulture damage report they have few neighbors who would report them to law enforcement authorities thus will not apply for a permit.

Table 10.2 - Migratory bird depredation permits recommended by WS and issued by the USFWS to alleviate vulture damage in Tennessee including authorized and reported take from 2002 – 2006.

Year	Permits recommended[a]	Permits issued	Authorized Take		Reported Take[2]	
			Black vultures	Turkey vultures	Black vultures	Turkey vultures
2002	13/9[b]	14/11[c]	492	401	163	103
2003	15/14	14/14	455	409	25	4
2004	4/3	15/15	510	429	22	18
2005	15/9	15/9	534	395	38	13
2006	24/9	15/5	309	50	54	11
Total	**71/44**	**73/54**	**2,300**	**1,684**	**302**	**149**

[a]Depredation permits recommend to the USFWS by WS for cooperators experiencing damage caused by vultures.
[b]The first number represents Black Vultures followed by Turkey Vultures (e.g., 13/9 shows 13 permits were recommended for Black Vultures and 9 permits were recommended for Turkey Vultures).
[c]The first number represents Black Vultures followed by Turkey Vultures (e.g., 14/11 shows 14 permits were issued for Black Vultures and 11 permits were issued for Turkey Vultures.

Since FY 2002, WS has received 422 requests for assistance to manage damage or threats to human safety from vultures in Tennessee (See Table 10.3). Nearly 83% of the requests for assistance were received by WS to manage damage to agricultural resources and to protect property. The number of requests received for agricultural resources has increased from 15 requests in FY 2002 to 68 in FY 2005, an increase of nearly 350%. The increasing vulture population in Tennessee as indicated by the BBS along with the increasing number of requests for assistances since FY 2002 has prompted the need for additional damage management activities to resolve vulture damage requests.

Table 10.3 – Request for assistance received by WS to manage damage caused by vultures in Tennessee by resource from FY 2002 through FY 2006.

Resource/Year	2002	2003	2004	2005	2006	Total
Agriculture	15	18	36	68	9	**146**
Property	40	45	76	31	12	**204**
Human Safety	24	21	16	3	8	**72**
Total	**79**	**84**	**128**	**102**	**29**	**422**

WS has implemented an integrated damage management approach using non-lethal and lethal methods that are adaptive to the damage or threat situation. Of the 15,118 vultures addressed since FY 2002 by WS in Tennessee, nearly 84% have been dispersed using non-lethal methods (See Table 10.4). A total of 2,433 vultures have been lethally taken by WS since FY 2002. The increase in take in FY 2005 and FY 2006 is due to an increase in requests for assistance from agricultural producers experiencing livestock losses due to vulture predation. Livestock damages caused by vultures in

Tennessee have been reported and verified by WS to occur to cattle, primarily calves, to goats, and to swine.

Table 10.4 - The percentage of Vultures killed by WS in Tennessee as compared to the total number of Vultures dispersed by WS in Tennessee annually from FY 2002 to FY 2006.

Fiscal Year	Vulture Take	Vultures Dispersed	Total Vultures Addressed	% Take vs. Dispersed
2002	126	2,907	3,033	4.2
2003	188	3,917	4,105	4.6
2004	95	1,773	1,868	5.1
2005	607	2,243	2,850	21.3
2006	1,417	1,845	3,262	39.1
Totals	**2,433**	**12,685**	**15,118**	**16.1**

Addressing damage to livestock from vultures can be difficult due to the unpredictability of when birthing will occur and the need for constant monitoring. The primary method used for managing damage to livestock from vultures is using live-traps followed by euthanasia. Unlike most harassment methods, live-traps do not require the constant presence of an individual to employ the method when vultures are present. Live-traps are the most effective method to resolve vulture predation due to the unpredictability of the livestock birthing process and the need for constant monitoring. Therefore, as requests to protect livestock from vultures increase, the number of vultures lethally removed will likely also increase since relocation is not feasible given the mobility of vultures. Based upon an increase in the requests for assistance to protect livestock from vulture predation, WS expects to lethally take no more than 500 Turkey Vultures and 2,500 Black Vultures each year under the proposed amendment to the EA.

BBS trend data from 1966-2005 (Sauer et al. 2006) indicates that black vulture populations have increased at an annual rate of 10.0%, 3.2%, and 2.7% throughout Tennessee, the U.S., and the eastern region of the BBS, respectively. From 1966-2005, Turkey Vulture trend data also indicates an increasing population trend at a rate of 3.2%, 1.5%, and 3.6% in Tennessee, the U.S., and the eastern region of the BBS, respectively (Sauer et al. 2006). As discussed previously, the survey limitations of the BBS do not adequately represent the relative abundance of vultures in the survey areas and are likely under reporting the number of vultures due to those limitations. Therefore, using the relative abundance for vultures is not appropriate due to those limitations. CBC data for Tennessee from 1966-2005 shows an increasing trend for wintering populations of Black Vultures and Turkey Vultures throughout Tennessee (Avery 2004, NAS 2006).

Based on vulture biology and ecology, BBS and CBC vulture population trend data, the limited number of vultures taken under USFWS issued MBTA depredation permits, the increasing number of vulture damage complaints for the protection of livestock, a comparison of the number of birds killed in proportion to the number of birds dispersed, and the limited lethal take of vultures in Tennessee proposed under this amendment (no more than 500 Turkey Vultures and 2,500 Black Vultures each year), WS' management actions should have minimal effects on the overall national, regional and state Black Vulture and Turkey Vulture populations.

10.1.3 Rock Pigeon Population Effects

Rock Pigeons are considered a non-native, invasive species in the U.S. and are afforded no protection under federal or state laws, including the MBTA. Rock Pigeons are non-indigenous and often have negative impacts on native wildlife populations, mainly through competition. Therefore, pigeons are considered by many wildlife biologists and ornithologists to be an undesirable component of North

American wild and native ecosystems. Any reduction in pigeon populations could be considered a beneficial impact to the environment. Any pigeon damage management involving lethal control actions by WS would be restricted to isolated, individual sites, or communities. In those cases where Rock Pigeons are causing damage or pose a threat to human safety, complete removal of the local population could be achieved. This would be considered to be a beneficial impact on the human environment since the affected property owner or administrator would request it. Although regional population impacts would be minor, even if significant regional or nationwide reductions could be achieved, this would not be considered an adverse impact on the human environment because the species is not part of native ecosystems. However, some individuals who experience aesthetic enjoyment from pigeons may consider a major population reduction in some localities as a negative impact.

According to BBS trend data provided by Sauer et al. (2006), from 1966-2005 Rock Pigeon populations have decreased at an annual rate of -1.2%, -0.1% and -0.4% in Tennessee, the eastern region of the BBS, and in the U.S., respectively. With a relative abundance of 5.04, a total Tennessee summer Rock Pigeon population could be estimated at approximately 21,253 birds. CBC data from 1966-2005 shows an increasing population trend for wintering populations of Rock Pigeons throughout Tennessee (NAS 2006).

Since pigeons are afforded no protection under the MBTA, the USFWS does not issue permits for the take of pigeons. Therefore, the take of pigeons by other entities besides WS is unknown. As stated previously, pigeons are a non-native, invasive species in the U.S. that actively competes with native species for habitat and other resources. However, impacts to the pigeon population from the cumulative actions of WS and other entities are not likely to cause a widespread decline of pigeons, even within Tennessee. WS' activities to manage damage caused by pigeons is site specific and targets those birds responsible for causing the damage or that threaten human safety.

In total, WS has received 125 assistance requests to manage damage caused by pigeons in Tennessee since FY 2002 (See Table 10.5). Prior to FY 2006, WS' lethal take of pigeons in Tennessee was within the scope of analysis in the EA. Despite the declining number of requests for assistance in FY 2005 and FY 2006, the number of pigeons lethally removed has increased. The increase in lethal take has occurred due to recent requests for assistance to manage pigeons at several industrial sites that are posing a threat to human safety and causing damage to property. Given the number of pigeons present and the limited applicability of non-lethal methods at those sites due to cost, size, and number of birds present, the use of lethal methods has been employed along with non-lethal damage management methods to resolve the threat to human safety and the damage to property.

Table 10.5 – Request for assistance to manage damage caused by Rock Pigeons received by WS from FY 2002 to 2006.

Resource/Year	2002	2003	2004	2005	2006	Total
Property	11	8	32	7	0	**58**
Human Safety	13	12	29	4	9	**67**
Total	**24**	**20**	**61**	**11**	**9**	**125**

WS reasonably anticipates requests to manage damage caused by Rock Pigeons in Tennessee to continue to increase, especially requests to protect human safety and property from large roosting populations of pigeons. Based upon the anticipated increase in requests, WS' reasonably expects to lethally take no more than 5,000 pigeons in any one year in Tennessee under the proposed amendment to the EA. As stated previously, using the relative abundance estimate available from the BBS, the pigeon population in Tennessee was estimated at 21,253 individuals.

However, like many bird populations closely associated with human habitation, pigeon population estimates are difficult to derive from BBS information. The survey methods used by the BBS misrepresents many of the bird species found closely associated with humans since routes are often established in more rural areas with more diverse habitat. Pigeons can be found in rural areas near human habitations however, pigeons are often concentrated in larger numbers in urban areas where food and shelter are more prevalent. Those urban pigeon populations are less likely to be surveyed under methods used in the BBS. Therefore, the BBS data provides trends in pigeon populations in Tennessee but the relative abundance is likely much higher given the sampling bias of the BBS for more diverse habitats. More exact population estimates for pigeons are currently unavailable in Tennessee. Thus, the relative abundance of the BBS is the best available information for estimating pigeon populations.

With an estimated population of 21,253 pigeons in Tennessee, WS would impact approximately 24% of the pigeon population in Tennessee with an annual take of 5,000 individuals under the proposed amendment to the EA. Given the inadequacies of the BBS in determining the relative abundance of pigeons, WS' annual impact is likely much lower.

Based upon BBS and CBC trend data, WS' lethal management actions affecting less than 25% of estimated summer breeding population and the fact these birds are considered a non-native invasive species, WS' limited lethal take of pigeons in Tennessee should have minimal effects on local, statewide, regional or continental pigeon populations.

10.1.4 Mourning Dove Population Effects

Mourning Doves are a common migratory bird in North America with breeding populations occurring from portions of southern Canada, throughout the U.S. into Mexico and Central America, including the Greater Antilles, Bermuda, and the Bahamas (Dolton et al. 2007). Many states in the U.S., including Tennessee, allow an annual harvest of Mourning Doves under guidelines and authorities of the USFWS. The number of Mourning Doves harvested during the 2004-2005 hunting season in Tennessee ranged from approximately 480,000 to 1.1 million birds (Dolton et al. 2006). During the 2005-2006 seasons, a total Tennessee harvest was estimated to range from approximately 405,000 to 860,000 birds (Dolton et al. 2007).

According to BBS trend data provided by Sauer et al. (2006), from 1966-2005 Mourning Dove populations have increased at an annual rate of 0.5% in the eastern region of the BBS and have decreased at an annual rate of -0.6% and -0.1% in Tennessee and the United States, respectively. With a relative abundance of 32.46, the breeding population of Mourning Doves in Tennessee could be estimated at approximately 137,000 birds. CBC data from 1966-2005 shows an increasing population trend for wintering populations of Mourning Doves throughout the state (NAS 2006). Analysis of BBS data by Dolton et al. (2007) indicated that more recent trend data from 1997-2006 showed an increasing population trend of 1.2% in Tennessee.

WS in Tennessee lethally remove a total of 718 Mourning Doves from FY 2002 through FY 2006 to enhance non-lethal harassment methods to resolve threats to human safety and property at airports. As part of an integrated management approach to reducing threats to human safety and property, WS dispersed at total of 14,575 doves from FY 2002 through FY 2006. Of the 15,293 doves addressed to reduce threats to human safety and property, only 4.7% were addressed using lethal methods. Due to an increase in the number of airports requesting assistance with managing threats to human safety and property posed by doves, WS reasonably anticipates an increase in the need to address threats posed by doves at airports and at electrical substations. To meet the increasing requests for services, WS

anticipates that no more than 1,200 Mourning Doves will be lethally removed annually under the proposed amendment to the EA. WS' lethal take of doves under the proposed amendment to the EA would represent approximately 0.1% - 0.3% of the number of Mourning Doves harvested by hunters during the 2005-2006 Mourning Dove harvest season.

As stated previously, Mourning Doves are protected under the Migratory Bird Treaty Act and take is limited by permit under the authority of the USFWS. The USFWS, as the agency with management responsibility of Mourning Dove populations, could impose restrictions on depredation harvest as needed to assure cumulative take does not adversely affect the continued viability of dove populations. This should assure that cumulative impacts on Mourning Dove populations would have no significant adverse impact on the quality of the human environment. The USFWS reported 826 doves were killed under 6 depredation permits issued since calendar year 2002 in Tennessee (See Table 10.6).

Table 10.6 - Migratory bird depredation permits issued by the USFWS to alleviate Morning Dove damage in Tennessee from FY 2002 to 2006.

Year	Permits Recommended	Permits Issued	Authorized Take Mourning Doves	Reported Take Mourning Doves
2002	1	2	1,200	739
2003	1	2	1,200	63
2004	1	1	1,200	0
2005	1	1	2,400	24
2006	0	0	0	0
Total	**4**	**6**	**6,000**	**826**

Based on the relative abundance available from the BBS, the breeding dove population in Tennessee could be estimated to be 137,000 birds. Based on this estimate, WS' lethal take of doves would total 0.9% of the estimated breeding population. However, requests for assistance to manage threats to property and human safety at airports occur mainly during migration periods of doves when the influx of migrating doves increases the statewide population. This influx is evident in the estimated dove harvest in Tennessee reported by the USFWS. The estimated number of doves harvested in Tennessee annually exceeds the estimated breeding population of doves using the relative abundance estimates provided by the BBS. The number of doves harvested in Tennessee during the 2005-2006 seasons exceeded the estimated breeding population by approximately 300% using the relative abundance estimate derived from the BBS.

WS' increased take of Mourning Doves under the proposed amendment will not significantly impact Mourning Dove populations in Tennessee, regionally, or nationally. WS' lethal take under the proposal will impact 0.9% of the estimated breeding dove population in Tennessee. However, given the annual harvest of doves in Tennessee and throughout the U.S., WS' take is expected to have no significant impact on dove populations. WS' take will not impact the ability of a person to harvest doves during the hunting season. WS' take will occur under a depredation permit to ensure any potential cumulative impacts from WS' activities are incorporated into the USFWS analyses of dove populations to ensure no adverse impacts on populations occurs.

10.1.5 Canada Geese Population Effects

Since the completion of WS' EA in 2002, the USFWS has finalized a FEIS addressing the management of resident Canada geese in the U.S., including potential impacts from activities to alleviate damage to agricultural resources, property, natural resources, and human safety (USFWS

2005). For many areas of the U.S., the resident Canada Goose population is currently exceeding the populations goals set by state wildlife agencies. In 2004, the resident goose population in Tennessee was estimated to be 53,254 geese which exceeded the population objectives for Tennessee by 18% (USFWS 2005).

As stated previously, requests for assistance to manage geese in Tennessee are expected to increase as resident goose populations continue to expand. WS continues to utilize an integrated damage management strategy to resolve request for assistance to alleviate damage caused by geese in Tennessee. Since 2002, nearly 96% of the geese addressed to resolve requests for assistance were relocated to areas where suitable habitat exists and landowners are willing to accept geese. Under the proposed amendment, WS will continue to relocate geese based on the availability of suitable habitat and on the willingness of landowners and resource managers to accept geese on property they own or manage. Due to the continued increase in resident Canada Goose populations in Tennessee, the number of suitable relocation sites and the number of property owners willing to accept geese as part of a relocation program have decreased.

As the number of suitable relocation sites declines, the number of geese euthanized to resolve requests for assistance is likely to increase. WS will continue to work with the TWRA to identify and relocate live-captured geese as part of an integrated damage management strategy. However, due to the continued increase in goose populations in Tennessee and the lack of available relocation sites, WS expects the take of geese to increase to no more than 2,000 annually under the proposed amendment.

Resident Canada Goose populations continue to increase across much of the U.S., including Tennessee. Resident goose populations are showing an 11.4% increase in Tennessee annually from 1966 through 2005 according to BBS (Sauer et al. 2006). In the eastern region of the BBS area, resident goose populations are also showing an increasing trend with an estimated 16.0% increase annually from 1966 through 2005 (Sauer et al. 2006). In 2006, the Tennessee spring goose population was estimated at 45,880 ± 10,707 individuals (TWRA 2006). The population goal of geese in Tennessee was set at 45,000 geese (USFWS 2005). Therefore, according to the 2006 spring goose estimate, the goose population in Tennessee is currently near the management goal set by TWRA.

In 2005, the goose harvest in Tennessee was estimated at 26,400 geese while in 2006, an estimated 23,575 geese were harvested during the Canada Goose season (TWRA 2006). Harvest estimates include the complete Canada Goose season which extends into the migratory period of geese. The number of resident geese harvested in Tennessee is unknown. Pursuant to the MBTA, the USFWS issued three depredation permits for Canada geese in Tennessee in 2006 (See Table 10.7). Of the 130 geese authorized to be taken, a total of 73 geese were reportedly taken by permit holders in 2006.

Table 10.7 - Migratory bird depredation permits issued by the USFWS to alleviate Canada Geese damage in Tennessee, 2002 – 2006.

Year	Permits Recommended	Permits Issued	Authorized Take Canada Geese	Reported Take Canada Geese
2002	21	2	230	43
2003	14	3	560	11
2004	16	2	780	21
2005	11	3	745	43
2006	18	3	130	73
Total	**80**	**13**	**2,445**	**191**

WS' anticipation of a need for increased take arises from coordination with the TWRA indicating a lack of potential relocation sites due to the increasing goose population and the increasing unwillingness of landowners and resource managers to accept relocated geese. As resident goose populations reach the established population goal in Tennessee, WS expects that program activities involving the relocation of geese will be similar to previous years. If goose populations continue to increase, the biological and social carrying capacity of geese will likely be met and exceeded. Under those circumstances that the carrying capacity, both biologically and socially, are met and exceeded, WS anticipates a need for an increase in take of geese to resolve requests to alleviate damage and threats to human safety. WS' coordination with the TWRA will ensure WS' activities do not impact goose populations in Tennessee and that the established population goals are met and maintained.

WS' goose damage management activities address damage and threats associated with primarily resident Canada geese. The majority of goose damage management activities occur during those months when geese present in Tennessee are considered resident[8]. However, requests to resolve damage caused by geese may occur throughout the year which may involve the take of geese outside the defined grouping of resident geese. Take outside the period of geese being considered resident occurs primarily at airports for the protection of human safety and property through the reduction of threats from aircraft strikes. However, requests can be received during the migratory period of geese to resolve damage and threats besides those that occur at airports. During the 2006 mid-winter survey conducted in January of waterfowl species in Tennessee, an estimated 33,559 Canada geese were present in the state (TWRA 2006). Take of geese outside of the period when resident geese may or may not be present in Tennessee is small and does not reach a magnitude where adverse impacts to migratory geese would occur based on the limited take of geese that has occurred previously in any given year. Under the amendment to the EA, an increase in the lethal take of geese will occur during those periods when geese are considered resident within Tennessee. Therefore, an increase in the take of those geese not considered resident is not expected to increase. Since a limited take of migrant geese is expected to occur annually, WS' anticipates that an increase in take of geese in Tennessee will not adversely impact migrant geese. An increase will also not adversely impact the ability of those interested persons to harvest migrant or resident geese during the regulated season.

Abundance indices conducted in the spring of 2007 estimated the Mississippi Flyway Giant Canada Goose population at 1.6 million birds (USFWS 2007). Since the majority of requests for assistance are received during the period of the calendar year when geese are considered resident in Tennessee, the population impact analysis of WS' take of geese will be conducted based on the conclusion that all geese taken will be resident geese. Migrant geese could be taken by WS during damage management activities conducted outside the periods when geese in Tennessee are considered resident but the impacts to the migrant goose population will be insignificant given that geese addressed by WS in Tennessee are primarily resident geese.

Based on the current resident goose population estimate for Tennessee, WS' take of 2,000 geese under the proposed amendment would reduce the resident population in Tennessee between 3.5% and 5.7%. WS' goose damage management activities are coordinated with the TWRA which ensures WS' activities are within the management goals set for resident geese in Tennessee. WS' does not anticipate an increase in take levels of geese unless the number of suitable relocation sites decreases which would likely occur during population increases that would lead to the biological and social carrying capacity being met within Tennessee. Therefore, WS' coordination of activities with the TWRA will ensure that any increased take levels are within and considered as part of the population goal established for resident Canada geese in Tennessee. Likewise, WS' take will not impact the

[8] See the 2005 FEIS developed by the USFWS for the management of resident Canada geese for a complete definition of geese that are considered resident in the U.S. (USFWS 2005).

ability of a person to harvest Canada geese during the regulated harvest season. WS' take will occur under a depredation permit to ensure any potential cumulative impacts from WS' activities are incorporated into the USFWS analyses of goose populations to ensure populations are not adversely impacted.

10.1.6 Birds for Disease Monitoring and Surveillance

WS is part of an interagency team conducting, assisting, and/or supervising the collection of biological samples for HP H5N1 AI surveillance. The proposed project focuses on surveillance and detection of HP H5N1 AI virus at its earliest stage in migratory birds to increase the capabilities for agencies to respond and reduce its spread among wildlife, poultry, and humans. In Tennessee, the AI surveillance project targets species and functional groups identified in WS' *Implementation Plan for HPAI Surveillance in Wild Migratory Birds in the United States* (USDA 2007*a*) as priorities for AI surveillance. The species lists and functional groups in the WS' plan were identified using Flyway Council regional AI surveillance plans, research identifying wild bird species as competent H5 and H7 reservoirs and carriers, and data from the 2006 North American HP H5N1 AI surveillance effort. Emphasis is placed on bird species that tested positive for low pathogenicity H5 or H7 AI during the 2006 HP H5N1 AI surveillance effort.

Samples collected for AI surveillance may include carcasses, tracheal and cloacal swabs, and environmental samples (*e.g*., feces, water). Most AI strains tend to replicate more efficiently in the intestinal tract than in the respiratory tract of natural host species. However, recent isolations of HP H5N1 AI virus in wild birds have documented higher levels of virus in tracheal samples. Therefore, cloacal and tracheal samples may be collected from birds. Details regarding AI sample collection, packaging and shipping can be found in WS' AI surveillance procedures manual (USDA 2007*b*). All samples will be submitted to an approved laboratory. Samples will be screened to determine if type A influenza virus is present; if the test is positive, the sample will be tested for the presence of H5 and H7.

The only surveillance strategies with the potential for impacts on target species populations is surveillance in wild birds that are captured by WS specifically for AI surveillance. Samples taken from birds already captured/handled for other projects (e.g., research projects) will not change the environmental status quo for target species populations because those actions would occur in the absence of AI surveillance. Thus, WS' collection of samples from those birds will have no additional environmental impacts beyond those that would occur in the absence of WS' AI surveillance. Investigation of morbidity/mortality events in wild birds will not impact target bird populations because those birds would either already be dead or are likely to die as a result of causes (*e.g.*, disease, injury) not related to the proposed action. Similarly, surveillance of birds harvested by hunters will not have an impact on target bird populations because those birds would have been killed by hunters in the absence of WS' activities. WS' actions will not contribute to mortality that would already occur. Sentinel bird sampling involves the use of domestically raised birds and will not result in handling or death of wild birds. Sampling of sentinel birds can be conducted without resulting in the death of the bird. Collection of fecal samples will not require capture or handling of birds, digging or other physical alteration of the environment or application of chemicals to the environment and, consequently, will have negligible environmental impacts.

WS' is also a part of an interagency team monitoring the occurrence of West Nile virus (WNV). WNV has emerged in recent years in temperate regions of North America, with the first appearance of the virus in North America occurring in New York City in 1999 (Rappole et al. 2000, MMWR 2002). Since 1999, the virus has spread across the U.S. and has been reported to occur in all states

except Hawaii and Alaska (CDC 2007a). WNV is typically transmitted between birds through mosquito vectors. Mammals can become infected if bitten by an infected mosquito, but individuals in most species of mammals do not become ill from the virus. The most serious manifestation of the WNV is fatal encephalitis in humans, horses, and birds.

WNV has been detected in birds of at least 317 species (CDC 2007*a*). Although birds infected with WNV can die or become ill, most infected birds do survive and may subsequently develop immunity to the virus (Cornell University 2003). In some bird species, particularly corvids (crows, jays, ravens, magpies), the virus causes disease (often fatal) in a large percentage of infected birds (MMWR 2002, Cornell University 2003, NAS 2003). In 2002, WNV surveillance/monitoring programs revealed that corvids accounted for 90% of the dead birds reported with crows representing the highest rate of infection (MMWR 2002). Large birds that live and die near humans (i.e. crows) have a greater likelihood of being discovered, therefore the reporting rates tend to be higher for those bird species and are a "good indicator" species for the presence of WNV in a specific area (Cornell University 2003, NAS 2003).

According to the National Wildlife Health Center (NWHC), information is not currently available to know whether or not WNV is having an impact on bird populations in North America (USGS 2003). Although, more recent studies of the BBS data have indicated that localized declines of certain bird populations could be linked to peaks in emergence of WNV in humans across the U.S. (LaDeau et al. 2007). The NWHC states that it is not unusual for a new disease to cause high rates of infection or death in naïve populations due to the lack of a natural immunity to the infection. The length of time needed for naïve populations to develop immunity to new diseases is unknown. Surveys of wild birds conducted since the first reported case of WNV have shown that some birds have already acquired antibodies to the virus (USGS 2003). USGS does not anticipate that the commonly seen species, such as crows and jays, will be adversely affected by the virus to the point that those bird species will disappear from the U.S. (USGS 2003).

Currently, WS does not actively collect samples for WNV monitoring activities in Tennessee. WS does provide technical assistance to cooperators requesting information on WNV. As part of an interagency team, WS' does collect dead birds or dying birds when WNV is a suspected cause in Tennessee when requested. As stated previously, WS' collection of dead or dying birds would not impact the environmental status quo since death would occur in the absence of any WS' action.

In the event of a widespread outbreak of WNV, WS is likely to work in conjunction with other federal, state, and local authorities in the collection and sampling of dead or dying birds. If collection of living birds is required as part of a coordinated surveillance effort for WNV, WS' take of birds would be regulated by the USFWS through the permitting process pursuant to the MBTA.

Based upon an anticipated increase in future requests for the collection of living birds through WS' involvement in disease surveillance and monitoring, WS predicts that no more than 100 individuals of any bird species, that is authorized by the USFWS and TWRA for such purposes, would be lethally removed annually under the proposed amendment for disease monitoring or surveillance. None of those bird species are expected to be taken by WS' at any level that would adversely affect overall bird populations. Those birds collected for disease surveillance and monitoring are protected by the MBTA under the management of the USFWS with take limited by permit. Therefore, those birds are taken in accordance with applicable state and federal laws and regulations authorizing take of migratory birds. The USFWS, as the agency with management responsibility, could impose restrictions on collections as needed to assure cumulative take does not adversely affect the continued viability of populations. This should assure that cumulative impacts on those bird populations would have no significant adverse impact on the quality of the human environment.

Based on the above information, USFWS involvement and oversight of permits regulating take along with WS' limited lethal take of bird for disease surveillance or monitoring, WS should have minimal effects on local, statewide, regional or continental bird populations.

10.2 Effects on Non-target Species Populations, Including Threatened and Endangered Species

The EA concluded that when WS' activities were conducted within the scope analyzed, bird damage management in Tennessee would not adversely affect any non-target wildlife species, including T&E species. Program activities and their potential impacts on non-target species have not changed from those analyzed in the EA.

10.2.1 Non-target Species Populations

The issue of non-target species effects, including effects on T&E species arises from the use of non-lethal and lethal methods identified in the alternatives. The use of non-lethal and lethal methods has the potential to inadvertently disperse, capture or kill non-target wildlife. WS' minimization measures and SOPs are designed to reduce the effects of bird damage management activities on non-target species' populations. To reduce the risks of adverse affects to non-target wildlife, WS selects damage management methods that are as target-selective as possible or apply such methods in ways to reduce the likelihood of capturing non-target species. Before initiating management activities, WS also selects locations which are extensively used by the target species and uses baits or lures which are preferred by those species. Despite WS' best efforts to minimize non-target take during program activities, the potential for non-target take exists when applying both non-lethal and lethal methods to manage damage or reduce threats to safety.

Non-lethal methods have the potential to cause adverse affects on non-targets primarily through exclusionary, harassment, and dispersal techniques. Any exclusionary device erected to prevent access of target species also potentially excludes species that are not the primary reason the exclusion was erected. Therefore, non-target species excluded from areas may potentially be adversely impacted if the area excluded is large enough. The use of auditory and visual dispersal methods used to reduce damage or threats caused by target species are also likely to disperse non-targets in the immediate area the methods are employed. Therefore, non-targets may be dispersed from an area while employing non-lethal dispersal techniques. However, like target species, the potential impacts on non-target species are expected to be temporary with target and non-target species often returning after the cessation of dispersal methods.

The lethal take of non-targets from using those methods described in the EA is unlikely with take never reaching a magnitude that a negative impact on populations would occur. Any potential non-targets captured using non-lethal methods are handled in such a manner as to ensure the survivability of the animal if released. The potential adverse affects associated with non-lethal methods are negligible and, in the case of exclusion and harassment methods, often temporary. The use of firearms is virtually 100% selective for target species since animals are identified prior to application; therefore no adverse impacts are anticipated from use of this method. The use of chemical methods, when used according to label directions, poses minimal hazards to non-target wildlife (USDA 1997, USDA 2002).

While every precaution is taken to safeguard against taking non-targets during operational use of methods and techniques for resolving damage and reducing threats caused by wildlife, the use of such methods can result in the incidental take of unintended species. Those occurrences are minimal and should not affect the overall populations of any species under the current program or

under the proposed amendment to the EA. WS' take of non-target species during activities to reduce damage or threats to human safety caused by bird species is expected to be extremely low to non-existent. WS will continue to monitor annually the take of non-target species to ensure program activities or methodologies used in bird damage management do not adversely impact non-targets.

Since the completion of the EA in 2002, a total of one Northern Flicker, three Northern Cardinals, four Ring-billed Gulls, two Mourning Doves, and two Blue Jays are known to have died as a result of WS' activities to resolve bird damage in Tennessee. WS' take of non-target species was within the estimated level of lethal take analyzed in the EA. WS concluded that the cumulative impact on non-target species is biologically insignificant to nonexistent and that WS' activities, when conducted within the scope analyzed in the EA, would not adversely affected the viability of any wildlife species populations through the BDM program.

The activities proposed under the amendment will not increase threats or risks to non-target wildlife beyond those described in the EA and this amendment. No new methods that are currently available in Tennessee are being proposed for use under the amendment that would significantly jeopardize non-target wildlife. Impacts to non-target wildlife from activities described under the proposed amendment are not likely to adversely impact non-target wildlife. Potential impacts to non-targets from WS' activities, including those proposed under the amendment, will remain as analyzed in the EA.

10.2.2 Threatened and Endangered Species

WS has reviewed the list of federally listed threatened and endangered species provided by the USFWS. Since the completion of the EA in 2002, ten additional wildlife species and one plant species have been listed as threatened or endangered by the USFWS in Tennessee. Those species include the American burying beetle (*Nicrophorus americanus*), clubshell (*Pleurobema clava*), ovate clubshell (*Pleurobema perovatum*), southern clubshell (*Pleurobema decisum*), Eskimo Curlew (*Numenius borealis*), goldline darter (*Percina aurolineata*), scaleshell mussel (*Leptodea leptodon*), Florida panther (*Puma concolor coryi*), palezone shiner (*Notropis albizonatus*), gray wolf (*canis lupus*), and American chaffseed (*Schwalbea americana*).

After review of the newly listed species and the methods available for use to manage bird damage in Tennessee, WS has determined that conducting BDM activities under the proposed action as described in the EA will have no effect on those species listed as threatened or endangered by the USFWS since the Decision/FONSI was signed in 2002 or their designated critical habitats. Activities described in the proposed amendment will also have no effect on those newly listed species or their critical habitats. No new methods or procedures have been identified in this monitoring report and proposed amendment that will jeopardize any threatened or endangered species. No take of any threatened and endangered species has occurred during WS' damage management activities in Tennessee.

10.3 Effects on human health and safety

WS' implementation of the program activities have not resulted in any adverse impacts to human health and safety. No injuries or safety issues have been reported to WS from activities conducted to manage damage caused by birds since the completion of the EA. Program activities and methods and their potential impacts on human health and safety have not changed from those analyzed in the EA. Activities proposed under the amendment will also have no impact on human health and safety as analyzed in the EA. No new methods that are available in Tennessee for bird damage management

activities are being proposed for use under the amendment. Therefore, the threats and risks associated with methods used by WS to manage damage and threats to human safety have not changed from those described in the EA.

10.4 Effects on socio-economics of the human environment

As described in the EA and as proposed under the amendment, WS would employ methods when requested that would result in the dispersal, exclusion, or removal of individuals or small groups of target bird species to resolve damage and threats. In some instances where birds are dispersed or removed, the ability of interested persons to observe and enjoy those birds will likely temporarily decline. However, the bird populations in those areas will likely increase upon cessation of damage management activities.

Even the use of exclusionary devices can lead to dispersal of birds if the resource being damaged was acting as an attractant. Thus, once the attractant has been removed or made unavailable, birds will likely disperse to other areas where resources are more vulnerable.

The use of lethal methods would result in temporary declines in local populations resulting from the removal of target bird species to resolve requests for assistance. WS' goal is to respond to requests for assistance and to manage those birds responsible for the resulting damage. Therefore, the ability to view and enjoy birds in Tennessee will still remain if a reasonable effort is made to locate birds outside the area in which damage management activities occurred.

The EA concluded the effects on aesthetics would be variable depending on the stakeholders' values towards wildlife. Program activities and methods and their potential impacts on human affectionate bonds with individual birds and aesthetics have not changed from those analyzed in the EA.

10.5 Humaneness and animal welfare concerns of methods used

As discussed in the EA, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

Some individuals believe any use of lethal methods to resolve damage associated with wildlife is inhumane because the resulting fate is the death of the animal. Others believe that certain lethal methods can lead to a humane death. Others believe most non-lethal methods of capturing wildlife to be humane because the animal is generally unharmed and alive. Still others believe that any disruption in the behavior of wildlife is inhumane. With the varied attitudes on the meaning of humaneness, the analyses must consider the most effective way to address damage and threats caused by wildlife in a humane manner. WS is challenged with conducting activities and employing methods that are perceived to be humane while assisting those persons requesting assistance to manage damage and threats associated with wildlife. The goal of WS is to use methods as humanely as possible to effectively resolve requests for assistance to reduce damage and threats to human safety. WS continues to evaluate methods and activities to minimize the potential pain and suffering of wildlife when attempting to resolve requests for assistance.

As mentioned previously, some methods have been stereotyped as "humane" or "inhumane". However, many "humane" methods can be inhumane if not used appropriately. For instance, a cage trap is generally considered by most members of the public as "humane". Yet, without proper care, live-captured wildlife in a cage trap can be treated inhumanely if not attended to appropriately.

Therefore, WS' mission is to effectively address requests for assistance using methods in the most humane way possible that minimizes the stress and pain of the animal. WS' personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Methods used in bird damage management activities in Tennessee since the completion of the EA and their potential impacts on humaneness and animal welfare have not changed from those analyzed in the EA. No new methods were identified in this report or in the proposed amendment that would alter the analysis contained in the EA on the issue of method humaneness. Therefore, the analyses of the humaneness of methods used by WS to manage damage and threats caused by birds have not changed from those analyzed in the EA.

11.0 Bird Damage Management Methods

A description of the BDM methods that could be used or recommended by WS is provided in Appendix B of the EA (USDA 2002), in Appendix J of WS' programmatic FEIS (USDA 1997), Appendix 4 of the USFWS Cormorant FEIS (USFWS 2003), and Chapter 2 (pages 1-9) of the USFWS Canada Goose FEIS (USFWS 2005). Since the completion of the EA, the following methods could be used or recommended as part of an integrated damage management strategy to alleviate bird damage:

11.1 Disease Surveillance and Monitoring

The ability to efficiently conduct surveillance for and detect HP H5N1 AI is dependent upon rapid detection of the pathogen if it is introduced. Effective implementation of a national high pathogenic H5N1 AI surveillance system will facilitate planning and execution at regional and state levels, and coordination of surveillance data for risk assessment. It will also facilitate partnerships between public and private interests, including efforts by federal, state, and local governments as well as non-governmental organizations, universities, and other interest groups.[9] Current information on high pathogenic H5N1 AI distribution and knowledge of the mixing of birds in migratory flyways noted previously was used to develop a prioritized sampling approach based on Alaska and the major North American flyways. Surveillance data from all of those areas will be incorporated into national risk assessments, preparedness and response planning to reduce the adverse impacts of a high pathogenic H5N1 AI outbreak in wild birds, poultry or humans.

To provide the most useful information and a uniform structure for surveillance, five strategies for collecting samples in birds are proposed (USDA 2005). These strategies include:

1. Investigation of Illness/Death in Birds: A systematic investigation of illness and death in wild birds may be conducted to determine if HP H5N1 AI is causing the illness and death of birds. This strategy offers the best and earliest probability of detection if HP H5N1 AI is introduced by migratory birds into the US. Illness and death involving wildlife are often detected by, or reported to natural resource agencies and entities. This strategy capitalizes on existing situations of birds without additional birds being handled or killed.
2. Surveillance in Live Wild Birds: This strategy involves sampling live-captured, apparently healthy birds to detect the presence of HP H5N1 AI virus. Bird species that represent the highest risk of being exposed to, or infected with, HP H5N1 AI virus because of their migratory movement patterns (USDA 2005), or birds that may be in contact with species from areas in Asia with reported outbreaks will be targeted. Where possible, this sampling effort will be coordinated with local projects that already plan on capturing and handling the

9 Data collected by organizations/agencies conducting research and monitoring for AI will provide a broad species and geographic surveillance effort.

desired bird species. Coordinating sampling with ongoing projects currently being conducted by state and Federal agencies, universities, and others maximizes use of resources and minimizes the need for additional bird capture and handling.

3. Surveillance in Hunter-harvested Birds: Check stations for waterfowl hunting provide an opportunity to sample dead birds to determine the presence of HP H5N1 AI and other AI viruses, and supplement data collected during surveillance of live wild birds. Sampling of hunter-killed birds will focus on hunted species that are most likely to be exposed to HP H5N1 AI; have relatively direct migratory pathways from those areas to the US via Alaska or directly to the Pacific Coast; commingle in Alaska staging areas with species that could bring the virus from Asia;
4. Sentinel Species: Waterfowl, gamefowl, and poultry flocks reared in backyard facilities may prove to be valuable for early detection and used as for surveillance of AI. Sentinel duck flocks may also be placed in wetland environments where they are potentially exposed to and infected with disease agents as they commingle with wild birds.
5. Environmental Sampling: Avian influenza is released by waterfowl through the intestinal tract and viable virus can be detected in both feces and the water in which the birds swim, defecate and feed. This is the principal means of virus spread to new birds and potentially to poultry, livestock, and humans. Analysis of water and fecal material from waterfowl habitat can provide evidence of AI circulating in wild bird populations, the specific AI subtypes, pathogenicity. Monitoring of water and/or fecal samples gathered from waterfowl habitat is a reasonably cost effective, technologically achievable means to assess risks to humans and poultry.

11.2 Nicarbazin (NCZ)

OvoControl–G™ is an EPA registered reproductive inhibitor containing NCZ that can be used to reduce Canada Goose egg production and viability. NCZ is registered for use at site specific locations in highly populated urban areas. The user of this chemical product must adhere to all EPA use restrictions. VerCauteren et al. (2000) examined the use of NCZ to reduce Canada Goose egg production and viability, and found that NCZ did experimentally reduce egg viability, but that there were difficulties in delivery methods and acceptance of treated feed. NCZ is not currently registered for use in Tennessee. If NCZ becomes available for use in Tennessee, WS will evaluate the use as part of an integrated damage management strategy and will modify the EA pursuant to NEPA.

12.0 Standard Operating Procedures

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for effects that otherwise might result from that action. As appropriate, mitigation measures are incorporated in WS' Standard Operating Procedures (SOP). The current WS' program, nationwide and in Tennessee, uses many SOPs. SOPs are discussed in Chapter 4 of the EA (USDA 2002), Chapter 5 of WS' programmatic FEIS (USDA 1997) and Chapter 4 of the DCCO FEIS (USFWS 2003).

Additional SOPs that have been incorporated into the Tennessee WS' BDM program since 2002 include:

- Agents acting under the authority provided to WS to conduct winter cormorant roost activities (50 CFR 21.47(c)(3)) and to protect public resources (50 CFR 21.48(c)(2)) will be informed and trained in the safe and proper use of cormorant damage management (CDM) methods including applicable laws and regulations authorizing use of those methods.
- To avoid or minimize adverse impacts on Double-crested Cormorants (DCCO) populations, WS will abide by the terms and conditions of the Public Resource Depredation Order (PRDO), Aquaculture Depredation Order (AQDO), and USFWS migratory bird permits issued to WS for

the management and control of DCCO damage and conflicts, including, but not limited to, reporting on annual basis the number of nests in which eggs were oiled or destroyed and the number of DCCO killed.

- Observations of birds in areas that are associated with cormorant concentrations are made to determine if non-target or T&E species would be at risk from CDM activities.
- CDM actions taken in mixed-species waterbird colonies would be conducted in such a manner to minimize impacts to non-target species (i.e. visiting sites at times of the day that would avoid thermal stress to eggs/nestlings, conducting actions as early as possible in the nesting season to reduce nestling abandonment, etc.).
- WS will abide by the conservation measures specified in the USFWS FEIS (USFWS 2003) to avoid adverse effects on listed species when conducting CDM activities.
- To avoid adverse impacts on non-target species, WS will abide by the terms and conditions of the PRDO, AQDO, and USFWS migratory bird permits issued to WS for the management and control of DCCO damage and conflicts.
- As specified in the PRDO (50 CFR 21.48(d)(10)), on an annual basis, WS is required to provide the USFWS with a statement of efforts being made to minimize incidental take of non-target species and also to report the number and species of migratory bird involved in such take, if any. The USFWS will review this information to ensure control activities taken under the PRDO will not adversely impact non-target migratory bird species.
- In certain circumstances when conducting control activities in DCCO breeding colonies, WS is required to notify the USFWS which species of other (non-target) bird species are present prior to conducting control activities (50 CFR 21.48(d)(9)). The USFWS will review this advanced notification to determine if the proposed project may threaten the long-term sustainability of non-target migratory bird species.
- Non-toxic shot will be used when using shotguns to harass or kill DCCOs.
- DCCO winter roost activities will be conducted in such a manner to limit potential exposure to wintering waterfowl.

13.0 Cumulative Impacts

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place over time.

WS' bird damage management activities would be the primary federal program with damage management responsibilities; however, other entities may conduct BDM activities in Tennessee as well as permitted by the USFWS and TWRA pursuant to the MBTA. Through ongoing coordination with the USFWS and TWRA, WS is aware of such BDM activities and may provide technical assistance in such efforts. WS does not normally conduct direct damage management activities concurrently with such agencies in the same area, but may conduct BDM activities at adjacent sites within the same timeframe. The potential cumulative impacts analyzed below could occur either as a result of WS' BDM program activities over time or as a result of the aggregate effects of those activities combined with the activities of other agencies and individuals.

13.1 Cumulative Impacts on Bird Populations

Evaluation of WS' activities relative to bird populations indicated that program activities will likely have no cumulative adverse effects on populations in Tennessee. WS' actions would be occurring

simultaneously, over time, with other natural processes and human generated changes that are currently taking place. Those activities include, but are not limited to:

- Natural mortality of birds
- Human-induced mortality through private damage management activities
- Human and naturally induced alterations of wildlife habitat
- Annual and perennial cycles in population densities

All those factors play a role in the dynamics of bird populations. In many circumstances, requests for assistance arise when some or all of those elements have contrived to elevate target species populations or place target species at a juncture to cause damage to resources. WS' actions taken to minimize or eliminate damage are constrained as to scope, duration and intensity, for the purpose of minimizing or avoiding impacts to the environment. WS evaluates damage occurring, including other affected elements and the dynamics of the damaging species; determines appropriate strategies to minimize effects on environmental elements; applies damage management actions; and subsequently monitors and adjusts/ceases damage management actions (Slate et al. 1992). This process allows WS to take into consideration other influences in the environment, such as those listed above, in order to avoid cumulative adverse impacts on target species.

No cumulative adverse impacts on bird populations are expected from WS' actions based on the following considerations:

13.1.1 Historical outcomes of WS' programs on wildlife

No cumulative adverse affects have been identified for birds as a result of program activities implemented over time based on analyses contained in the EA, from annual monitoring reports, or from analyses contained in the proposed amendment

13.1.2. SOPs and mitigation strategies built into WS' program

SOPs and mitigation measures are designed to reduce the potential negative effects of WS' actions on wildlife, and are tailored to respond to changes in wildlife populations which could result from unforeseen environmental changes. This would include those changes occurring from sources other than WS. Alterations in program activities are defined through SOPs and mitigation measures, and implementation is insured through monitoring, in accordance with the WS' Decision Model (Slate et al. 1992).

13.1.3. Current status of potentially affected wildlife species

Natural and human-induced mortality patterns for birds are expected to remain essentially unchanged in Tennessee despite WS' activities. As a result, no cumulative adverse affects are expected from repetitive damage management programs over time in the fairly static set of conditions currently affecting wildlife in Tennessee.

13.1.4. Migratory Bird Treaty Act, as amended

The MBTA, as amended places the protection of all bird species designated under the Act under the management authority of the USFWS. All take for damage management purposes is authorized by permit pursuant to the Act issued by the USFWS. Oversight of the allowed take of bird species by the USFWS ensures cumulative impacts are considered and addressed when determining the allowable take of bird species to ensure the viability of a population. The

allowed take, including cumulative take, is analyzed and determine by the USFWS prior to the issuance of permits under the MBTA. Therefore, WS' allowed take, as authorized by the USFWS by permit, should not reach a level where cumulative take would adversely impact bird populations.

13.2 Cumulative Impact Potential from Chemical Components

BDM programs which include the use of pesticides as a lethal population management component may have the greatest potential for cumulative impacts on the environment. Potential impacts relate to the deposit of chemical residues in the physical environment causing environmental toxicosis. DRC-1339 and Avitrol are the only chemicals used or recommended by the Tennessee WS' BDM program for the purpose of obtaining lethal effects on birds. Those chemicals have been evaluated for possible residual effects which might occur from buildup of the chemicals in soil, water, or other environmental sites.

DRC-1339 exhibits a low persistence in soil or water, and bioaccumulation of the chemical is unlikely (USDA 1997). Additionally, the relatively small quantity of DRC-1339 that will be used in BDM programs in Tennessee, the chemical's instability which results in degradation of the product, and application protocol used in WS' activities further reduces the likelihood of any environmental accumulation. DRC-1339 is not used by any other entities in Tennessee.

Avitrol may be used or recommended by the Tennessee WS' program. Most applications would not be in contact with soil, applications would not be in contact with surface or ground water, and uneaten baits will be recovered and disposed of according to EPA label specifications. Avitrol exhibits a high persistence in soil and water but, according to literature, does not bioaccumulate (USDA 1997, EXTOXNET 2000). Because of Avitrol's characteristic of binding to soils, it is not expected to be present in surface or ground water as a result of its use on land (EPA 1980). A combination of chemical characteristics and baiting procedures used by WS would reduce the likelihood of environmental accumulation of Avitrol. The EPA has not required studies on the fate of Avitrol in the soil because, based on use patterns, soil residues are expected to be low (EPA 1980).

Based on use patterns, the chemical and physical characteristics of DRC-1339 and Avitrol, and factors related to the environmental fate of those pesticides, no cumulative impacts are expected from the lethal chemical components used or recommended by the WS' BDM program in Tennessee.

Non-lethal chemicals may also be used or recommended by the WS' program in Tennessee. Characteristics of those chemicals and use patterns indicate that no significant cumulative impacts related to environmental fate are expected from their use in WS' BDM activities in Tennessee.

13.3 Cumulative Impact Potential from Non-chemical Components

Non-chemical methods used or recommended by WS' BDM program may include exclusion through use of various barriers, habitat modification of structures or vegetation, live trapping and euthanasia of birds, harassment of birds or bird flocks, and shooting.

Because shooting may be considered as a component of the non-chemical, the deposition of lead shot in the environment is a factor considered in the EA and this amendment.

Lead Shot. Threats of lead toxicosis to waterfowl from the deposition of lead shot in waters where such species feed were observed more than one hundred years ago (Sanderson and Bellrose

1986). As a result of discoveries made regarding impacts to several species of ducks and geese, federal restrictions were placed on the use of lead shot for waterfowl hunting in 1991. "Beginning September 1, 1991, the contiguous 48 United States, and the States of Alaska and Hawaii, the Territories of Puerto Rico and the Virgin Islands, and the territorial waters of the United States, are designated for the purpose of Sec. 20.21 (j) as nontoxic shot zones for hunting waterfowl, coots, and certain other species. 'Certain other species' refers to those species, other than waterfowl or coots, affected by reason of being included in aggregate bags and concurrent seasons."

All WS' BDM shooting activities conform to federal, state and local laws. If activities are conducted near or over water, WS uses non-toxic shot during activities. Consequently, no deposition of lead in non-toxic shot zones is likely to occur as a result of WS' BDM actions in Tennessee. Therefore, cumulative impacts are not likely to occur if toxic shot is used. Additionally, WS will evaluate other BDM actions which entail the use of shot on a case by case basis to determine if deposition of lead shot poses any risk to non-target animals, such as domestic livestock. If such risk exists, WS will use non-toxic shot in those situations.

Roost Harassment/Relocation. Some potential exists for cumulative impacts to human health and safety related to the harassment of roosting bird flocks such as blackbirds and European Starlings in urban environments. If birds are dispersed from one site and relocate to another where human exposure to concentrations of bird droppings over time occurs, human health and safety could be threatened. If WS is providing direct operational assistance in relocating such birds, coordination with local authorities may be conducted to assure they do not re-establish in other undesirable locations.

Literature Cited

Avery, M. L. 2004. Trends in North American Vulture Populations. Proc. 21st Vertebr. Pest Conf. R. M. Timm and W. P. Gorenzel, Eds. Univ. of Calif., Davis: 116-121.

Blem, C. R. 1995. Winter abundance of vultures in Florida 1965-1993. The Raven 66:83-86.

Brown, W. H. 1976. Winter population trends in the black and turkey vultures. American Birds 30:909-912.

Buckley, N. J. 1999. Black Vulture (*Coragyps atratus*). *In* The Birds of North America, No. 411 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Bunn, A. G., W. Klein, and K. L. Bildstein. 1995. Time-of-day effects on the numbers and behavior of non-breeding raptors seen on roadside surveys in eastern Pennsylvania. J. Field Ornithology 66:544-552.

Carter, M. F., W. C. Hunter, D. N. Pashley, and K. V. Rosenburg. 2000. Setting conservation priorities for landbirds in the United States: the Partners in Flight approach. Auk 117:541-548.

CDC. 2007a. West Nile Virus. Centers for Disease Control and Prevention. http://www.cdc.gov/ncidod/dvbid/westnile.

CDC. 2007b. Avian Influenza. Centers for Disease Control and Prevention. http://www.cdc.gov/flu/avian/

Cleary, E.C., S.E. Wright, and R. A. Dolbeer. 2006. Wildlife strikes to civil aircraft in the United States 1990-2000. U.S. Dept. of Trans., Federal Aviation Admin. Serial Report No. 12. Washington, DC. 64pp.

Coleman, J. S. and J. D. Fraser. 1989. Habitat use and home ranges of black and turkey vultures. J. Wildl. Manage. 53:782-792.

Cornell University. 2003. West Nile Virus: Transmission, Infection, & Symptoms. Environmental Risk Analysis Program, Cornell University – Department of Communication & Center for the Environment. http://environmentalrisk.cornell.edu/WNV/Summary2.cfm

Dolton, D. D. and R. D. Rau. 2006. Mourning Dove population status, 2006. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.

Dolton, D. D., R. D. Rau, and K. Parker. 2007. Mourning dove population status, 2007. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.

EPA (U.S. Environmental Protection Agency). 1980 (Sept.). Pesticide registration standard: 4-aminopyridine: avitrol. Office of Pesticides and Toxic Substances. Washington, DC.

EXTOXNET (Extension Toxicology Network). 2000. 4-Aminopyridine. Pesticide Information Profiles. Coop. Ext. Offices at Cornell Univ., OR State Univ., Univ. of ID, Univ. of CA-Davis, and the Instit. for Envir. Toxicology, MI State Univ. Information taken from Internet site http://pmep.cce.cornell.edu/profiles/extoxnet/24d- captan/4aminopyridine-ext.html

Federal Aviation Administration. 2006. FAA National Wildlife Aircraft Strike Database 2006. US Dept. of Trans., Federal Aviation Admin. 800 Independence Avenue, SW Washington, DC 20591. http://wildlife.pr.erau.edu/public/index1.html

Geissler, P. H. and J. R. Sauer 1990. Topics in route-regression analysis. Pages 54-57 *In* J. R. Sauer and S. Droege, editors. Survey designs and statistical methods for the estimation of avian population trends. U.S. fish and Wildlife Service, Bioloigcal Report 90(1).

Kiff, L. F. 2000. The current status of North American Vultures. Pages 175-189 in Raptors at Risk. R. D. Chancellor and B. U. Meyburg eds. Hancock House.

Kirk, D. A. and M. J. Mossman. 1998. Turkey vulture. *In* A. Poole and F. Gill (eds), The birds of North America, no. 339. The Birds of North America, Inc. Philadelphia, PA.

LaDeau, S. L., A. M. Kilpatrick, and P. P. Marra. 2007. West Nile virus emergence and large-scale declines of north American bird populations. Nature 447:710-714.

Link, W. A. and Sauer, J. R. 1998. Estimating population change from count data: application to the North American Breeding Bird Survey. Ecological applications 8:258-268.

Lowney, M.S. 1999. Damage by black and turkey vultures in Virginia, 1990-1996. Wildl. Soc. Bull. 27:715-719.

MMWR. 2002. Morbidity and Mortality Weekly Report: Provisional Surveillance Summary of the West Nile Virus Epidemic – United States, January-November 2002. Center for Disease and Surveillance; December 20, 2002. Vol. 51; No. 50.

NAS. 2003. National Audubon Society. West Nile Virus – Effects on Wildlife. www.audubon.org/bird/wnv/

NAS. 2006. National Audubon Society. The Christmas Bird Count Historical Results. www.audubon.org/bird/cbc. July 2006.

Peterjohn, B. G. 1994. The North American Breeding Bird Survey. Partners in Flight. 5:6

Peterjohn, B. G. and J. R. Sauer. 1993. North American breeding bird survey annual summary 1990-1991. Bird Populations 1:1-15.

Rabenhold, P. P. and M. D. Decker. 1989. Black and turkey vultures expand their ranges northward. The Eyas. 12:11-15.

Rappole, J.H., S.R. Derrickson, and Z. Hubalek. 2000. Migratory birds and the spread of West Nile virus in the Western Hemisphere. Emerging Infectious Diseases 6(4):319-328.

Sanderson, Glen C. and Frank C. Bellrose. 1986. A Review of the Problem of Lead Poisoning in Waterfowl. Illinois Natural History Survey, Champaign, Illinois. Special Publication 4. 34pp. Jamestown ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/pbpoison/index.htm (Version 17OCT97).

Slate, D.A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. In *Trans. N. A. Wildl. Nat. Res. Conf* 57:51-62.

Sauer, J. R., D. D. Dolton, and S. Droege. 1994. Mouring dove population trend estimates from call-count and North American breeding bird surveys. J. of Wildl. Manage. 58:506-515.

Sauer, J. R., J. E. Hines, and J. Fallon. 2006. The North American breeding bird survey, results and analysis 1966 - 2005. Version 6.2.2006, USGS Patuxent Wildlife Research Center. Laurel, MD.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. The North American Breeding Bird Survey, Results, and Analysis 1966 - 2003. Version 200x.2, U.S.G.S. Patuxet Wildlife Research Center, Laurel, MD.

Sweeney, T. M. and J. D. Fraser. 1986. Vulture roost dynamics and monitoring techniques in southwest Florida. Wildlife Society Bulletin 14:49-54.

TWRA. 2006. Waterfowl technical report, 2005-06. TWRA Tech. Report No. 06-04. 173 pp.

USDA. 1997. Final Environmental Impact Statement. USDA, APHIS, ADC Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

USDA. 2002. Environmental Assessment (EA): Bird Damage Management in the Tennessee Wildlife Services Program. USDA-APHIS-Wildlife Services, 537 Myatt Drive, Madison, TN 37115. http://www.aphis.usda.gov/wildlife_damage/nepa.shtml

USDA. 2005. An Early Detection System for Asian H5N1 Highly Pathogenic Avian Influenza in Wild Migratory Birds. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Operational Support Staff, Riverdale, Maryland, USA. 87pp.

USDA. 2007*a*. Implementation plan for HPAI surveillance in wild migratory birds in the United States – April 2007. USDA, Animal and Plant Health Inspection Service, Wildlife Services Disease Surveillance and Emergency Response Program, Fort Collins, CO.

USDA. 2007*b*. Wildlife Services and State/Tribal Cooperator Avian Influenza Surveillance Procedure Manual – March 2007. USDA, Animal and Plant Health Inspection Service, Wildlife Services Disease Surveillance and Emergency Response Program, Fort Collins, CO.

USFWS. 2003. Final Environmental Impact Statement: Double-crested Cormorant Management. U.S. Dept. of the Interior, USFWS, Div. of Migratory Bird Management, 4401 N. Fairfax Drive MS 634, Arlington, VA 22203.

USFWS. 2005. Resident Canada Goose Management: Final Environmental Impact Statement. United States Fish and Wildlife Service, Division of Migratory Birds. Arlington, VA. http://www.fws.gov/migratorybirds/issues/cangeese/finaleis.htm

USFWS. 2007. Waterfowl population status, 2007. U.S. Department of the Interior, Washington, D.C. U.S.A.

USGS. 2003. NWHC West Nile Virus Project. United States Geological Survey-National Wildlife Health Center. www.nwhc.usgs.gov/research/west_nile.html

VerCauteren, K.C., M.J. Pipas, and K.L. Tope. 2000. Evaluations of nicarbazin-treated pellets for reducing the laying and viability of Canada goose eggs. Proc. Eastern Wildl. Damage Management Conf., State College, PA. 337-346.

Wilbur, S. R. 1983. The status of vultures in the western hemisphere. Pages 113 -123 In Vulture biology and management. Eds. by S.R. Wilbur and J.A. Jackson. Univ. Of CA Press. Berkeley.